Transport Canada
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Transport Canada Aviation Forecasts 1990–2003

TRANSPORT CANADA
AVIATION FORECASTS
1990-2003
TP 7960 E

ERRATA

Page 16 Figure 3-4

the legend reads ...tonne-km/employee

should read ...'000 tonne-km/employee

b) Productivity

reads ...productivity increased from 125 to 143 tonne-kilometres per employee (an average rate of 2.3% per year).

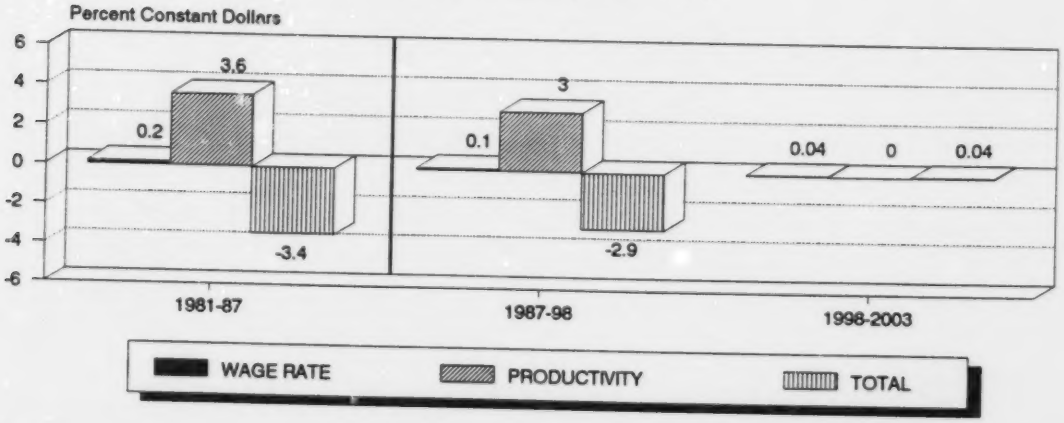
should read ...productivity increased from 114,000 to 141,000 tonne-kilometres per employee (an average rate of 3.6% per year).

reads ...labour costs...were reduced by 4.1% annually...

should read ...labour costs...were reduced by 3.4% annually...

Page 17 - see revised Figure 3-5

Figure 3-5 (Revised)
Labour Expense Forecast
Average Annual Growth Rate (%)



Page 19 Figure 3-9

the legend reads ... fuel purchased

should read ...fuel consumed per tonne-km

Page 20 d) Fuel Efficiency

reads ...the quantity of fuel purchased

should read ...the quantity of fuel consumed per tonne-km

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Transport Canada Aviation Forecasts 1990–2003

TP 7960E

Air, Statistics and Forecasts
Policy and Coordination

Ce document est aussi disponible en français (TP 7960F)

PREFACE

This report has been prepared by the Economic Analysis Directorate of Transport Canada's Policy and Coordination Group for the benefit of planners, administrators, and managers of air transport facilities and services in Canada and for the general public. The Air Statistics and Forecasts Branch prepared the aviation forecasts and assumes overall responsibility for the long-term forecasts of air traffic volumes at Canadian airports. The forecasts include estimates of passengers, cargo,and aircraft movements, and are presented on a national, regional and site-specific basis.

In addition, the Economic, Surface and Marine Statistics and Forecasts Division described the economic conditions expected to prevail throughout the forecast period and provided socio-economic inputs to the aviation forecast models and authored Chapter 2 as well as various sections of the report dealing with socio-economic forecasts and alternative economic scenarios (Appendix A). The most frequently consulted source of socio-economic forecasts was Informetrica Ltd.

The report also sets out the major assumptions regarding airline strategy and aircraft operations, alternative (high and low) forecast scenarios, the accuracy of previous forecasts, the forecasting methodology used and the terminology employed. In addition, national totals are forecast for registered aircraft, licensed personnel and hours flown. The site forecasts are limited to the "Top 77" Canadian airports for passengers and aircraft movements, and to the "Top 30" Canadian airports for cargo.

Persons intending to use the aviation forecasts contained in this report should first consult the Air Statistics and Forecasts Branch of Transport Canada to ascertain whether more recent forecasts have been produced. Any comments or suggestions concerning these forecasts are welcome and should be sent to:

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1. INTRODUCTION AND SUMMARY

1.1 GENERAL INFORMATION

The information in this report represents Transport Canada's official forecasts for the aviation industry up to the year 2003. Transport Canada uses these forecasts to provide a credible and consistent foundation for:

- the development of air transport policy;
- the financial management of the Department;
- the planning, design and programming of Transport Canada airports; and
- the planning, design and programming of Canada's systems of air navigation and air traffic control.

The forecasts were prepared by the Air Statistics and Forecasts Branch as part of a biennial general revision of all of Transport Canada's predictions of direct aviation activity. This update was done to take into account the changes in the outlook for economic growth and announced plans for airline industry operations. Consolidation within the Canadian airline industry and the development of hub-and-spoke networks linking smaller regional/local carriers to the trunk routes of affiliated major carriers have brought about significant changes in airline and airport operations, necessitating a review of the previous forecasts.

State-of-the-art forecasting techniques were used in preparing measures of expected aviation activity (see Appendix C for details on the methodology). The most recent available information on the underlying assumptions has been incorporated in the new forecasts. Although these forecasts represent a best effort at charting the anticipated course of aviation in Canada, the future remains uncertain. Accordingly, the forecasting process includes high-growth and low-growth alternative scenarios, as well as the most-likely base case. The base case is used throughout the report proper in presenting assumptions and forecasts. Highlights of the high-growth and low-growth scenarios are presented in Appendix A.

This report presents forecasts of the level of direct aviation activity from 1989 to 1998 and 1998 to 2003. Direct aviation activity is defined by the following indicators of traffic volumes:

- enplaned-and-deplaned passengers;
- revenue passenger-kilometres;
- enplaned-and-deplaned cargo;
- itinerant aircraft movements;
- fleet of registered aircraft;
- licensed aviation personnel; and
- hours flown.

(For definitions of terms, see Glossary, Appendix D)

Separate forecasts are provided for passengers, cargo and aircraft movements, as set out below:

1. For passengers and aircraft movements there are system-wide "macro" forecasts, broken down by geographic sector, namely Domestic (Dom), Transborder (TB), and Other International (OI);
2. For all indicators, there are national total forecasts, with details by Transport Canada region (see map, Appendix D), i.e., Atlantic (Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick), Québec (Québec and Eastern N.W.T.), Ontario, Central (Manitoba, Saskatchewan and Central N.W.T.), Western (Alberta, Yukon, and Western N.W.T.) and Pacific (British Columbia); and
3. For passengers, cargo and aircraft movements, there are sets of individual site forecasts, including detailed discussions for the nine largest Canadian airports, namely Pearson (Toronto), Vancouver, Dorval and Mirabel (Montréal), Ottawa, Winnipeg, Edmonton, Calgary and Halifax.

The forecasts themselves are presented in Chapters 4, 5 and 6, dealing respectively with passengers, cargo and aircraft movements. Preceding these are two chapters of background information: Chapter 2 discusses the economy, and Chapter 3 describes trends in the airline industry and in general aviation.

1.2 REVIEW OF RECENT TRENDS IN AVIATION TRAFFIC

Since 1984, passenger traffic demand has grown at an average annual rate of about 5%. More recently, traffic growth in 1988 was exceptional due mainly to the wide availability of discount fares. Traffic in 1989 continued to grow, although at a much slower rate. During the same period, air cargo growth surpassed that of passenger growth while itinerant aircraft movements increased at a more modest average annual growth rate of about 4%. The increased freedom of access to the domestic air travel market in southern Canada, following economic regulatory reform, occasioned a brief period of increased competition from new entrants. However, more recently the trend has been toward consolidation into two national air transportation networks, headed by major carriers who have increased their span of control by acquiring a substantial interest in affiliated regional/local carriers. With limited scope for expansion in a well-served domestic market, both major Canadian carriers are attempting to grow by increasing their international business. There is some question whether the relatively small Canadian market can support two transcontinental systems in the face of rising costs and the need to be competitive in the global marketplace. This question is discussed further in Chapter 3 of the report.

Recent trends in aviation traffic at Canadian airports are summarized in Table 1–1 below.

Table 1–1
Aviation Traffic at Canadian Airports
(Average Annual % Change)

	1977–1981	1981–1984	1984–1989
Passengers (E&D) (Top 77 Airports)	6.1	–2.1	4.9
Cargo (E&D) (Top 30 Airports)	2.6	5.0	5.4
Movements (ltin) (Top 77 Airports)	2.5	–6.0	4.2

1.3 SUMMARY OF ECONOMIC FORECASTS

The aviation forecasts shown in later chapters are based upon certain expectations for the economies of Canada,the United States and the rest of the world. These expectations are discussed at length in Chapter 2 and summarized below.

As we enter the 1990s the trend toward increased globalization continues as producers, consumers, governments and markets witness growing interdependence and interconnectedness of national economies.

1.3.1 Canada

The rate of growth for Canada over the period 1989–2003 is expected to average 2.5% a year, compared with the vigorous 3.9% enjoyed from 1984 to 1989. Despite a marked slowdown during 1990–91, the average annual rate of growth for the sub-period 1989–1998 should be 2.4% compared with 2.6% for the years 1998 to 2003. Forecasts for the major socio-economic variables affecting the Canadian economy are shown in Table 1–2 below.

Table 1–2
CANADA
Macroeconomic Indicators
Historical and Forecast
(Average Annual % Change)

	HISTORICAL	FORECAST	
	1984–1989	1989–1998	1998–2003
GDP (real)	3.9	2.4	2.6
PDI/Capita (real)	2.3	0.9	1.1
Population	1.0	0.9	0.7

The reason why the 1989–2003 forecast for Gross Domestic Product (GDP) is not expected to match the historical 1984–1989 rate of growth is two-fold. First, the 1982 recession had left a stock of underutilized human and capital resources available, which, when called upon, helped increase growth from 1984 to 1989 beyond normal potential. Second, growth foreseen for the forecast period (particularly 1998–2003) will be subject to the already-present demographic forces that will limit labour-force growth and thus reduce economic performance.

Recognized in these forecasts are two significant economic policies expected to facilitate Canada's integration in the world economy as well as to increase the country's potential economic growth. The first policy relates to increasing access for Canadian exports to foreign markets by lowering of trade barriers, as in the Canada-U.S. Trade Agreement. The second policy is the overhaul of the federal tax system to reduce taxes on manufacturers and to redress inequities which have tended to favour

imports over domestic goods. Phase 1 of Tax Reform focussed on income taxes and has been implemented gradually over the last two years. Phase 2 will replace the federal manufacturers' sales tax with a value-added Goods and Services Tax in 1991. These two policies account for most of the difference between the present forecast of economic growth and the one presented in 1988.

1.3.2 The United States

The U.S. Gross Domestic Product (GDP) for the period 1989–2003 is forecast to increase at the rate of 2.2% a year, with a slightly higher average growth for the years 1989–1998 than for 1998–2003. With demographic developments similar to those underway in Canada, a reduced supply of labour and a low population increase will limit economic growth, mostly from 1998 to 2003. Table 1–3 below indicates anticipated growth rates for selected U.S. socio-economic factors.

Table 1–3
UNITED STATES
Macroeconomic Indicators
Historical and Forecast
(Average Annual % Change)

	HISTORICAL	FORECAST	
	1984–1989	1989–1998	1998–2003
GDP (real)	3.3	2.3	2.1
PDI/Capita (real)	1.9	1.8	1.4
Population	1.0	0.7	0.6

With an unemployment rate of about 5%, the U.S. begins the 1990s with an economy close to what is conventionally regarded as full employment. This may put upward pressure on wages and reduce real growth in the short term, but unlike in Canada no serious slowdown is expected in the U.S. By the end of this decade, both the trade and fiscal deficits are expected to improve significantly. The uncertainty is the longer-term effects of a possible trade agreement with Mexico.

1.3.3 The Rest of the World

For present purposes, this category includes not only the more important industrialized economies outside North America, namely Japan, Germany, the United Kingdom, France, Italy and the USSR, but also many smaller developed Newly Industrialized Economies (NIEs) as well as developing countries. Forecasts of growth in population and GNP for this group of countries are presented in Table 1–4 below.

Table 1–4
REST OF THE WORLD
Macroeconomic Indicators
Historical and Forecast
(Average Annual % Change)

	HISTORICAL	FORECAST	
	1984–1989	1989–1998	1998–2003
GDP (real)	2.8	3.5	3.6
Population	1.7	1.4	1.5

For the Rest of World, the change in growth rates from the period 1984–1989 to 1989–2003 is different from that expected for Canada and the U.S. Whereas future economic growth in North America is expected to slow down in comparison with that of the last decade, economic performance elsewhere is expected to accelerate. There are three reasons for this divergence in economic outlook.

First, since the recession of the early 1980s, the economic performance of many major European countries, and to some extent Japan, has been lower than potential, resulting in an underutilization of both physical and human capital. These resources are expected to be more fully utilized in the future.

Second, the slowdown in population growth, which has only now started to affect the Canadian and U.S. economies, had a much earlier start in Europe. Rates of change in population there are nearly stable. Outside Europe, population growth has been only marginally reduced.

Finally, with expanding world markets and a relative increase in the well-being of Pacific Rim and other NIE populations, these countries are expected to expand production at a faster rate than in the past.

1.4 SUMMARY OF AVIATION TRAFFIC FORECASTS

The aviation traffic (passengers, cargo and aircraft movements) expected at Canadian airports during the 1989–2003 period mirrors the moderate but steady growth anticipated for the economy.

The long-term outlook for growth in airline passenger traffic in Canada is generally consistent with the forecast presented in the previous report

Transport Canada Aviation Forecasts 1988–2001. However, the composition of the traffic is expected to change as the Canada-U.S. traffic expands significantly. In the short term, however, the outlook for passenger traffic is more modest due mainly to air-fare increases, primarily in the Domestic and Transborder sectors.

Airline passenger traffic is forecast to grow at an average annual rate of 4.1% during the 1989–2003 period. This rate represents a slight decline over the average of 4.9% from 1984 to 1989.

Cargo tonnage is expected to increase at only 3.5% per annum during the forecast period. This represents a reduction from the 5.4% average growth from 1984 to 1989. The anticipated slowing in air cargo growth stems from the forecasted dampening of growth in the Canadian economy.

The outlook for total itinerant aircraft movements is one of relatively slow growth, with the rapid expansion of the air carrier component now largely complete and no resurgence expected in recreational activity. Itinerant aircraft movements are expected to increase at an annual rate of 2.1% between 1989 and 2003.

Table 1–5 summarizes the Transport Canada forecasts for the above-mentioned indicators of aviation traffic.

Table 1–5
Aviation Traffic at Canadian Airports
(Average Annual % Change)

	1989–1998	1989–2003
Passengers (E&D) (Top 77 Airports)	4.3	4.1
Cargo (E&D) (Top 30 Airports)	3.5	3.5
Movements (Itin.) (Top 77 Airports)	2.2	2.1

2. THE ECONOMIC OUTLOOK

2.1 THE RECENT PAST (1984–1989)

The value of goods and services produced by the Canadian economy grew by an average of 3.9% a year from 1984 to 1989. This high rate of growth was due to a 1.2% gain in productivity coupled with the highest rate of increase in employment among all the industrialized nations—2.7%. On the expenditure side, consumer spending on durable goods and housing, along with business outlays for machinery and equipment, contributed strongly to this growth. Consumer and business demand led to increased imports, which grew at over 9% a year, twice the rate of growth in exports. As a result, the contribution of the international sector was negative.

Weakness in the primary sector (agriculture, fishing and mining) restricted growth in the goods-producing industries to a 3.8% annual average. In turn, this meant fewer shipments, and growth in the transportation services sector fell to under 2% a year, less than half the rate for the services sector as a whole.

In 1984, personal real disposable income per capita was just regaining its 1981 pre-recession level. Phase 1 of the federal tax reform program, which took effect in 1987–1988, provided a much-needed lift to disposable income and allowed it to increase by an average of 2.3% a year.

After 1984 the economy improved with the addition of more than 1.5 million jobs and a reduction of almost four percentage points in the unemployment rate, the most impressive performance among all macroeconomic variables. At the end of 1989, 67% of all Canadians available for work were in the labour market and 92.5% of them were employed. Sustained by high immigration levels and a stable fertility rate from 1986 to 1989, growth in population averaged 1.0% per year.

From 1984 to 1989, inflation as measured by the Consumer Price Index (CPI) averaged 4.3% a year, with the price of services increasing at a faster rate than the price of goods.

During these five years, total government expenditures on goods and services grew at an average of 2.5%, the smallest increase among all major demand components, reflective of a policy of fiscal restraint. Monetary policy was also in step with fiscal policy. The Bank of Canada rate moved from less than 10% in 1983 to about 14% in early 1990. The interest-rate differential thus created between Canada and the U.S. reached record levels and was instrumental in maintaining the exchange rate of the Canadian dollar at a level harmful to Canadian exporters.

From an average of slightly over 77 cents U.S. from 1984 to 1989, the Canadian dollar reached 87 cents U.S. by mid-1990. This rapid appreciation eliminated the cost differential favouring Canada in many industries. Vis-à-vis other major currencies the appreciation of the Canadian dollar was less spectacular.

The behaviour of energy prices is of importance to the economy as a whole and especially to the transportation sector. During the 1984–1989 period, dramatic drops in crude-oil prices helped improve the cost performance of many airlines. Additional oil price reductions resulted from a higher Canadian-dollar exchange rate, lower refinery margins and the stabilization of the federal excise tax on fuel.

Underlying all these movements are basic structural shifts, some of which began as early as the 1970s, that continue to affect the national economy and its transportation components and will no doubt merge with further shifts yet to come. Specifically, there have been modifications to the demographic characteristics of the country as a result of immigration, aging, and an increasing proportion of women in the labour force. Changes in the way in which we conduct business have resulted from the 1987 National Transportation Act and the Canada-U.S. Trade Agreement. More shifts in the economy are expected to result from the implementation of the Goods and Services Tax in 1991 and possibly from tighter environmental controls.

At the world level there have been significant developments which influence Canada. The formation of economic power blocs, increased globalization of trade and greater reliance upon interdependent multinational commodities, labour and financial

transactions have already been observed. The development of the Newly Industrialized Economies such as Korea and Taiwan is expected to continue. As well, recent and still-unfolding political developments such as those in the Middle East will have an indirect effect on the economic well-being of Canadians.

Currently, foreign market conditions are in a state of flux, with economic liberalization likely to follow political restructuring. A higher demand for consumer and capital goods in Eastern Europe will likely result in higher prices, including interest rates. Moreover, we are witnessing the formation of continental trading blocks whereby not only goods and services, but also labour, will cross borders freely.

Within Canada, interprovincial differences in human capital, economic structure and natural resources dictate that economic growth will not be at a uniform rate.

When Gross Domestic Product growth for the country as a whole averaged 3.9% a year (1984–1989), provincial growth rates varied from 2.0% for Prince Edward Island to 4.7% for Ontario. Primary sector disturbances were implicated in the lower growth in the Atlantic region (fishing), in Manitoba and Saskatchewan (agriculture) and in Alberta (crude oil).

In spite of poor economic growth in the Atlantic region, there were some advances within the area. In Newfoundland, with the lowest personal real disposable income per capita of any province, disposable income per person increased by an average of 4.2% a year from 1984 through 1989, the highest rate among the provinces. However, since this growth was unmatched by increases in production, the change in relative income may prove to be short-lived. Prince Edward Island and Nova Scotia are in a similar situation.

Provincial population growth rates for the 1984–1989 period varied greatly, from –0.1% per year for Newfoundland to an average of 1.5% for Ontario and British Columbia, two major destinations for immigrants and internal migration.

Historical growth for these indicators is shown in Table 2–1 for Canada and in Table 2–2 for the provinces.

2.2 FORECAST FOR THE CANADIAN ECONOMY

Canada is entering the nineties on a somewhat pessimistic note. The Canadian dollar overvaluation is largely due to the high differential between Canadian and U.S. interest rates. Inflationary pressures are present, and growth in domestic demand continues to outpace the economy's capacity to increase production, bringing about a surge in imports and a record current-account deficit of almost $20 billion in 1989. In addition, Phase 2 of tax reform, the GST, is about to be implemented, with most of its negative impact expected to take place during the first two years.

Of crucial importance for the realization of short- and medium-term Canadian economic objectives is the abatement of interest rates. If they remain at the present high level long enough, their adverse effects could prevail long after their fall. Here is why. Higher interest rates may result in lower investment, which may lead to lower productivity gains and therefore higher prices (substitution of labour for capital will also amplify this effect); the higher cost of borrowing may become embodied in a new cost structure, thus increasing prices; and finally, higher interest rates lead to higher debt servicing and, probably, to higher indirect taxes if government deficit reduction is maintained as a priority.

Over the longer term, however, the growth suggested by the macroeconomic forecasts presented here will be much restricted by demographic factors and assumptions with respect to public, private, domestic and foreign initiatives apt to influence economic activity.

2.2.1 Socio-economic Assumptions Influencing the Canadian Economy

The U.S. economy is forecast to grow at an average rate of 2.4% over the period 1989–2003. At 2.5% a year, growth during the subperiod 1989–1998 will exceed the 2.1% expected for 1998–2003. As in Canada, much of the expected slowdown in the U.S. during the second subperiod will have a demographic origin. A higher growth rate may be expected if the U.S. manages to increase its world trade share.

Demographic factors in the rest of the world are not expected to restrict economic growth as in Canada and the U.S. GNP growth elsewhere is forecast to average 3.5% a year during the period 1989–2003.

Before the invasion of Kuwait it was expected that crude-oil prices would, on average, increase at 1% above inflation every year. In the spring of 1990 the OPEC marker price of a barrel of oil in 1990 was expected to average around $15.50 (U.S.) and reach about $36 in year 2003. Expressed in 1990 dollars, the cost of that same barrel of oil was forecast to be around $18 in year 2003. Subsequent events in the Gulf States have changed the short-term outlook for oil.

Table 2–1
CANADA
Macroeconomic Indicators
Historical and Forecast
(Average Annual % Change)

	LEVEL	HISTORICAL	FORECAST	
	1989	1984–1989	1989–1998	1998–2003
GDP (real)	411.7[1]	3.9	2.4	2.6
PRDI/Capita (real)	10,899.0[2]	2.3	0.9	1.1
Population	26,219.0[3]	1.0	0.9	0.7
Adult Pop.	18,843.0[4]	1.5	1.3	1.1
CPI	151.0[5]	4.3	4.9	4.9

[1] Billions of 1981 dollars
[2] 1981 dollars
[3] In thousands
[4] Age 20 and over, in thousands
[5] 1981 = 100.0

It is too early to say how or if the long-term assumptions presented in this report will be affected by the Middle East situation.

This forecast includes national and provincial effects of the Free Trade Agreement (FTA) between Canada and the U.S. Basically, it has been assumed that the most immediate effect of secured market access is an increase in investment. This increase, in combination with other related changes, will result in additional Canadian GDP growth of approximately 0.25% per year.

In addition to the effects of Phase 1 of the Tax Reform, as included in our forecast two years ago, the present forecast accounts for the effects of Phase 2, the implementation of the Goods and Services Tax (GST). With tax reform, national macro effects are less noticeable than with the FTA, but interprovincial and interindustry changes resulting from the GST are nevertheless important. Since almost all services will now be taxed, the most crucial aspect of the GST, no doubt, will be its effect on the price of services and hence the demand for such services. The prospective impact on air travel is certainly a striking example.

The interest-rate differential which has, by mid-1990, pushed the value of the Canadian dollar to about 87 cents U.S. will be reduced to near-historical levels, and the Canadian dollar will depreciate before it starts its FTA-induced appreciation and reach the level of 90 cents U.S. in year 2003. However, the longer the influence of the high interest-rate differential, the more entrenched the FTA becomes and, hence, the less likely it is that a devaluation will precede the expected longer-term appreciation of the Canadian dollar vis-à-vis the U.S. dollar.

With respect to population, the following assumptions are made. Aggregated provincial fertility rates will yield a national rate of 1.7 births per woman of childbearing age. International immigration will reach 200,000 persons in 1995–1996 and remain at that level until the end of the forecast period, while international emigration will be steady at 80,000 persons annually. As a result, population during the period 1989–2003 is expected to increase at the rate of 0.8% a year. The interprovincial migration pattern of the future reflects a partial return to the situation observed between 1977 and 1981 when the energy boom was on. This situation favours the western provinces, but adjustments have also been made in favour of the Atlantic provinces, mostly Newfoundland, to take account of Hibernia oil-field construction.

2.2.2 The National Forecast

In 1990, after almost seven years of above-potential growth, Canada will likely sustain a growth rate of under 0.9%, with an unemployment rate averaging almost 8.5%.

Economic growth during the forecast period will be determined, to a large extent, by demographic forces and by policy-induced productivity changes. Growth from the year 1989 to 2003 (Table 2–1) is not expected to be as high as in the period 1984–1989, but rather closer to potential (2.4%–3.0%), for two basic reasons. First, the 1982 recession had left a glut of underutilized resources, the absorption of which

during the years 1984–1989 helped increase economic growth beyond potential. Second, the stream of baby-boomers that helped increase the labour force and employment until recently is finally subsiding. The economic slowdown expected in 1990 will bring the average growth rate during the subperiod 1989–1998 to 2.4%. (Figure 2–1)

Another characteristic of the period 1989–2003 is again related to demography. The long-term drop in the unemployment rate is expected largely because baby-boomers have now moved into an age group that has a lower unemployment rate.

Although the effects of the demographic factors were recognized a few years back, the present forecast includes two policies of prime importance to the transportation services sector and not covered in any earlier forecast, namely the Free Trade Agreement (FTA) and Phase 2 of Tax Reform, the Goods and Services Tax. It is mainly due to these two policies that investment and, to a lesser extent, exports are expected to be the major forces which drive the growth reflected in this economic forecast.

Secured access to the larger U.S. market and the GST (final consumption tax) are likely to reduce production costs and increase productivity, exports and investments. Not only is Canada expected to increase its trade with the U.S., but also over the longer run, productivity gains will help Canadian exporters compete in other countries in the global context. The first phase of such an increase in investment has already taken place but seems to have been somewhat impeded by higher interest rates. Businessmen blame high interest rates for the present major economic slowdown in the Canadian economy. In fact, persistently high interest rates (in view of massive capital requirements in Eastern Europe as well as a shrinking Japanese trade surplus), constitute one of the basic risks to the short- and mid-term realization of this forecast.

Growth in personal real disposable income per capita (PRDI/Capita) will be commensurate with total production. However, higher taxes and higher inflation will erode such growth. Because of the GST, prices in 1991 are expected to increase by about 5.5%. In the longer term, an improved price performance may be hindered by a demographically induced tightness in the labour market.

2.2.3 The Provincial Forecasts

Economic growth is usually not distributed equally among provinces, and the recent past and future offer no exception. On account of slowing increases in population, GDP growth during 1989–2003 (see Table 2–2) will be lower than that of 1984–1989 in all provinces except Newfoundland, where the Hibernia project is expected to raise the GDP growth rate above the national average. However, with substantial imports from other provinces, the total benefits will be spread to other regions as well.

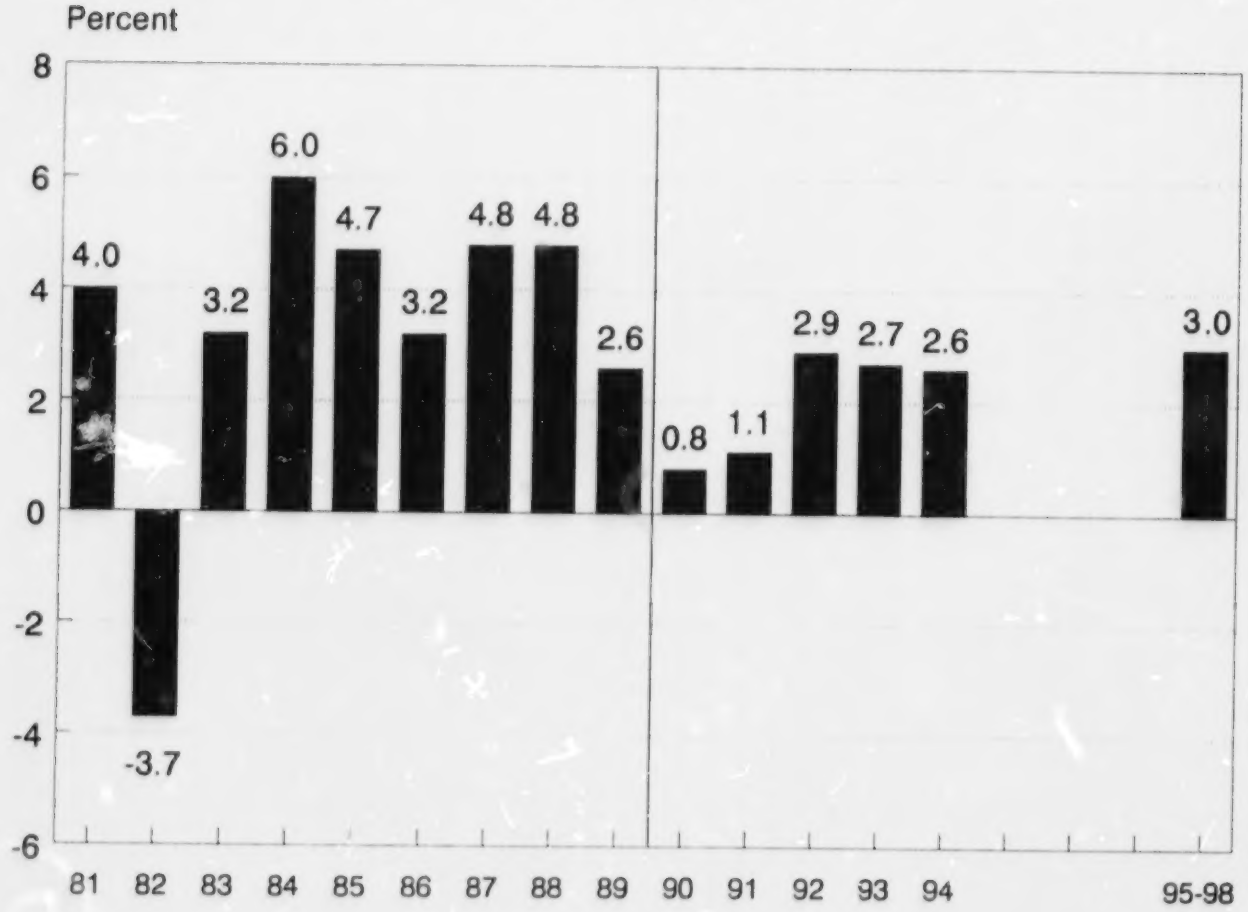
More generally, economic growth prospects in the Atlantic region have diminished because of many changes: a drop in fishing and fish processing (affecting all Atlantic provinces); the winding-down of the Canadian Forces Base in Summerside (P.E.I.); and continued supply constraints in the forestry and

Table 2–2
Provincial Macroeconomic Indicators
Historical and Forecast
(Average Annual % Change)

PERIOD		NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.
Historical (1984–1989)	GDP	2.3	2.0	2.8	3.9	3.4	4.7	3.7	3.3	2.4	3.7
	PRDI/Capita	4.2	3.3	3.0	3.4	2.9	2.1	1.1	1.2	1.8	1.8
	Population	(0.1)	0.8	0.6	0.3	0.6	1.5	0.6	0.8	0.8	1.5
Forecast (1989–1998)	GDP	3.4	1.9	1.5	1.3	2.6	2.8	1.6	2.6	2.3	1.7
	PRDI/Capita*	0.1	0.6	1.0	0.7	0.7	0.9	1.4	2.4	1.3	0.9
	Population	0.2	0.3	0.5	0.3	0.4	1.0	0.6	0.8	1.6	1.3
Forecast (1998–2003)	GDP	1.8	1.4	1.8	1.9	2.6	3.1	1.7	2.1	2.3	2.3
	PRDI/Capita*	1.1	1.3	1.4	1.1	1.3	1.0	1.0	1.5	0.9	0.8
	Population	0.1	0.4	0.3	0.2	0.4	0.7	0.4	0.4	0.8	0.7

* Growth rates for PRDI/Capita are respectively, 1983–1988, 1988–1997 and 1997–2002.

Figure 2–1
Gross Domestic Product
Canada 1981–1998, % Change, Based on 1981$



pulp-and-paper sectors (Nova Scotia). Long-term growth prospects for New Brunswick, founded on housing and food-and-beverage production are hampered by the continued slowdown in North American population and household growth.

For Québec, economic growth will exceed the national level. However, the continued structural changes in its economy tend to make the province less insulated from North American slowdowns.

Ontario's economy tends to mirror basic changes in the national economy. Over the short term, the automotive industry will be hardest hit by the 1990 economic slowdown. Expansion thereafter will favour mostly investment goods industries as industrial restructuring for Free Trade continues.

Sectors mainly responsible for slow economic growth in Western Canada over the last few years, namely agriculture, mining and energy production, should now turn around and add impetus to the Prairie provinces' economies and help restart the diversification effort. Additional growth should also come from other related sectors, such as construction and services. Contribution to growth will come first from agriculture and subsequently from other sectors.

For British Columbia, reduced demand in the U.S. housing market and the high Canadian dollar may result in lower short- to medium-term growth in the province's major industries, namely forestry, lumber, and pulp and paper. These same sectors, as well as the export of coal, should provide impetus for the provincial economy during the nineties and later.

2.3 WORLD FORECAST

It is unlikely that anything will alter the future course of world politics and economics as much as what is presently taking place in Europe, the Soviet Union and the Middle East. East and West have embarked on a journey of rapid economic and political changes and alliances. (Some Pacific Rim countries are also in an economic take-off situation characterized by sizeable increases in their GNP). Although intended to increase ultimately the amount of goods and services at the disposal of each individual, these changes are expected to have other important effects on countries like Canada, which heavily depend on external trade. However, at present, the full consequences of these changes are difficult to forecast.

In view of the prosperity ensuing from the market economy that is expected to spread in varying degrees to Eastern European countries and the gradual elimination of almost all trade barriers in Western Europe, Canada must position itself to enhance its trade relations with the new Europe. In that context, the Canadian transportation system, particularly aviation, will have two concurrent roles. Air traffic between Canada and Europe and between Canada and the Pacific Rim should serve both as a leading indicator of increased trade and as a catalyst to trade itself.

2.3.1 The U.S. Economy

The U.S. economic forecast for 1989–2003 depicts a situation similar to that in Canada: a slowdown from the high growth of the recent past (See Table 2–3).

Although the U.S. economy is expected to experience below-potential growth in 1990–91, there is no recession in view. However, the timing of this slowdown spells bad news for Canada: the American situation can accentuate or prolong the present slowdown of our own economy. Nevertheless, one beneficial outcome may be a relaxation of U.S. monetary policy, with corresponding action in Canada.

The longer-term growth rate for the U.S. economy will average around 2.2% a year, with marginally higher growth in the subperiod 1989–1998 than in 1998–2003. Demographic forces will be mostly responsible for the slowdown in the latter period.

Since the U.S. economy has become more open, world competitiveness is becoming increasingly important, particularly vis-à-vis low-wage Newly Industrialized Economies (NIEs). Because it is becoming more difficult to compete on the basis of product quality, pressure on prices may tend to further reduce long-term income growth.

As a result of reduced East-West tensions a "peace dividend", albeit small, has been included in this forecast. The proceeds are likely to be used during the period 1989–1998 to increase personal income as well as to reduce the federal deficit.

Until a solution is found to what has become a chronic trade deficit, the U.S. economic machine must attract $10 billion of foreign capital every month. However, it is hoped that some relief may come from consumers: a drop in the high-valued U.S. dollar may induce a reduction in consumer imports while in the longer-term the U.S. personal savings rate (currently one of lowest among the major

Table 2–3
UNITED STATES
Macroeconomic Indicators
Historical and Forecast
(Average Annual % Change)

	LEVEL	HISTORICAL	FORECAST	
	1989	1984–1989	1989–1998	1998–2003
GDP (real)	3,772.0[1]	3.3	2.3	2.1
PRDI/Capita (real)	10,722.0[2]	1.9	1.8	1.4
Population	248,251.0[3]	1.0	0.7	0.6
Adult Pop.	176,972.0[4]	1.4	1.1	0.7
CPI	138.7[5]	3.9	4.3	4.0

[1] Billions of 1981 U.S. dollars
[2] 1981 dollars
[3] In thousands
[4] Age 20 and over, in thousands
[5] 1981 = 100.0

industrial countries) is expected to increase and thus help finance that deficit.

2.3.2 The Rest Of The World

Economic performance of the rest of the world, which includes not only the more important industrialized countries (Japan, Germany, the United Kingdom, France, Italy and the USSR), but also many smaller developed NIEs and developing countries, is expected to outpace that of North America. GDP and population growth forecasts for this group of countries are presented in Table 2–4 below.

Table 2–4
REST OF THE WORLD
Macroeconomic Indicators
Historical and Forecast
(Average Annual % Change)

	HISTORICAL	FORECAST	
	1984–1989	1989–1998	1998–2003
GDP (real)	2.8	3.5	3.6
Population	1.7	1.4	1.5

For the rest of the world, the growth pattern of the period 1989–2003 as compared with 1984–1989 is different from that for North America. Relative to the last decade, future economic growth is expected to slow down in North America, but accelerate in the rest of the world. Three basic reasons help explain this situation.

First, since the recession of the early eighties, the economic performance of many major European countries, and to some extent Japan, has been lower than potential, resulting in an underutilization of both physical and human capital. In fact, in 1989 the U.S. was the only one among all seven major industrial countries to post an unemployment rate lower than its average pre-recession level. In addition, in 1989, the unemployment rate in the European Community more than doubled. It is expected that many of these underused resources will be reabsorbed.

Second, the population slowdown which started to affect the Canadian and the U.S. economies only a few years back had a much earlier start in Europe. For example, in the U.K., the annual population growth rate for 1989–2003 is expected to remain virtually unchanged from the approximately 0.3% that has persisted for most of the last 15 years. In most European countries, rates of change in population are now nearly stable. Outside Europe, the slowdown in population is only marginal.

Finally, expanding world markets and a relative increase in the well-being of the populations of NIEs on the Pacific Rim and elsewhere are expected to expand production in these countries at a faster rate than in the past.

2.4 RISKS AND OPPORTUNITIES

It was mentioned earlier that, in the present phase of the economic cycle, short- to medium-term growth in economic activity as outlined above is very much dependent on the behaviour of interest rates. In the

event that higher rates materialize, economic growth for the period 1989–2003 may drop to an average of about 2.2% per year. However, if, as some forecasters are speculating, a faster drop in interest rates occurs, growth may average as high as 3.0% per year, with an average growth rate of 3.5% for the sub-period 1992–98. In these two alternative scenarios, the provinces most affected would include those committed to high business investment outlays, namely Ontario, Québec, Alberta and British Columbia. Appendix A outlines these two alternative scenarios.

3. AVIATION FORECAST ASSUMPTIONS

A. THE AIRLINES

3.1 SUPPLY FACTORS AFFECTING THE AIRLINES

3.1.1 Concentration in the Industry and at Airports

The 1984 announcement of a new domestic air carrier policy together with the federal government's discussion paper entitled "Freedom To Move", initiated a movement toward the economic regulatory reform of the air carrier industry in Canada. As a result, most government controls were eliminated in the South and reduced in the North. The two largest airlines have tried to maximize the benefits of economic regulatory reform in two ways. First, they have bought substantial positions in regional and local carriers to secure feeder traffic for themselves from points outside the metropolitan areas served by their trunk routes. Second, they restructured some of their domestic service patterns into hub-and-spoke networks, focussing on the major airport in each region of the country and using these regional focal points as hubs to their systems. With the acquisition of Wardair by Canadian Airlines International Limited (CAIL), the outcome of regulatory reform in Canada has been the emergence of a duopoly in the long-haul domestic market, supported by affilated regional and local carriers.

Table 3–1 shows the market shares held by Air Canada and CAIL and their regional/local affiliates in comparison with those held by other carriers operating in Canada.

Table 3–1
The Canadian Airline Industry
MARKET SHARES

AIR CANADA	C.A.I.L. & WARDAIR	INDEPENDENTS
48.6%	49.4%	2.0%

NOTE: Based on 1988 revenue passenger-kilometres reported by Level 1–4 carriers, affiliates included, scheduled services for all sectors.

Figure 3–1 sets out the organizational affiliations of the two major Canadian carriers and indicates the geographic distribution of affiliate-carrier services.

This restructuring of carrier relationships has permitted more frequent flights to smaller centres. Regional and local carriers use mostly turboprop aircraft on their short-haul, low-density routes to offer more flights with the economies of operation associated with smaller planes. Air Canada and CAIL have turned over feeder routes to their affiliates and have embarked on the purchase of new, more fuel-efficient aircraft, which offer greater flexibility in serving a variety of high-density and long-haul trunk routes.

The adoption of a hub-and-spoke network has had a significant impact on hub airports. The capacity of major airports' air-traffic-control services and runways to handle greatly increased traffic at peak periods has been severely strained at major hubs. To cope with the added traffic, the federal government announced plans for additional capacity at airports such as Pearson (Toronto) and Vancouver International.

3.1.2 Airline Costs

a) *Labour*

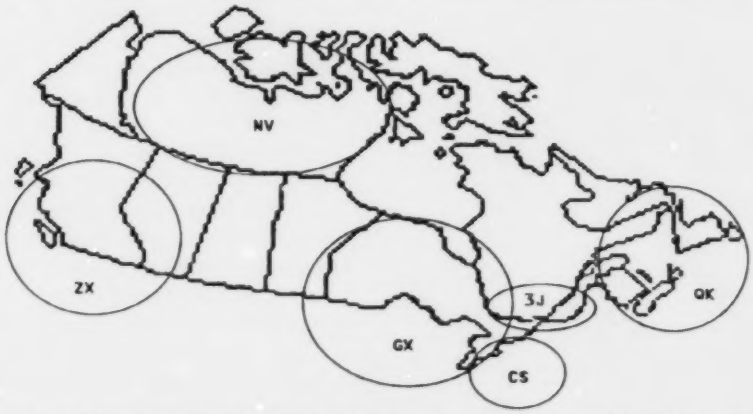
As Figure 3–2 indicates, labour constitutes the largest single cost component for Canadian air carriers. In 1988, Level 1 carriers spent over 27% of their operating expenses on labour. However, this represents a substantial decline from the more than 31% attributed to labour in 1984.

Employment levels in the Canadian airline industry have declined in recent years as a result of mergers in the industry. Shrinkages in numbers of staff through company reorganizations have been accentuated by sagging profit levels in the industry. Reductions in administrative and support staff are likely to continue in the face of financial difficulties. Anticipated traffic increases will result in gradual strengthening of employment in operating positions. Figure 3–3 shows the historical employment levels and average wages (in real and current dollars) in the industry.

Figure 3–1
Level 1 Airline Affiliations

AIR CANADA

AFFILIATES	RELATIONSHIP
Air Ontario (GX)	75% owned
Air BC (ZX)	85% owned
Air Nova[1] (QK)	49% owned
Air Alliance (3J)	75% owned
Northwest Territorial (NV)	90% owned
Air Toronto[1] (CS)	
(*Commuter Express*)	codesharing

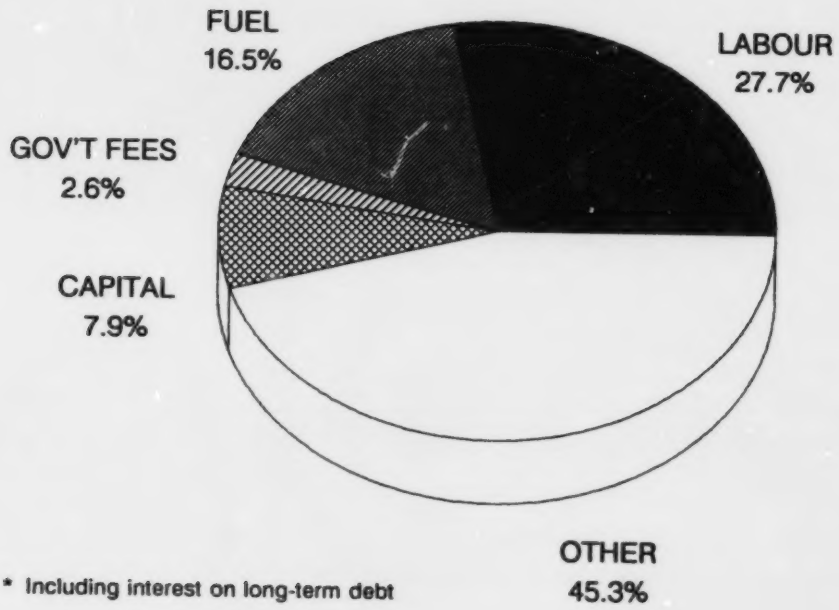


[1] Air Canada has announced its intent to increase its share of ownership of Air Nova and to purchase Air Toronto

CANADIAN AIRLINES INTERNATIONAL LTD.

AFFILIATES	RELATIONSHIP
Ontario Express (9X)	47% owned
Time Air (KI)	46% owned
Air Atlantic (9A)	45% owned
Calm Air Int'l (MO)	45% owned
Air St. Pierre (PJ)	codesharing
Air Alma (4I)	codesharing

Figure 3–2
Canadian Carrier's Operating Expenses*
Level 1—1988



* Including interest on long-term debt

Figure 3–3
Employment in the Air Carrier Industry
Employees and Wages
1979–1988

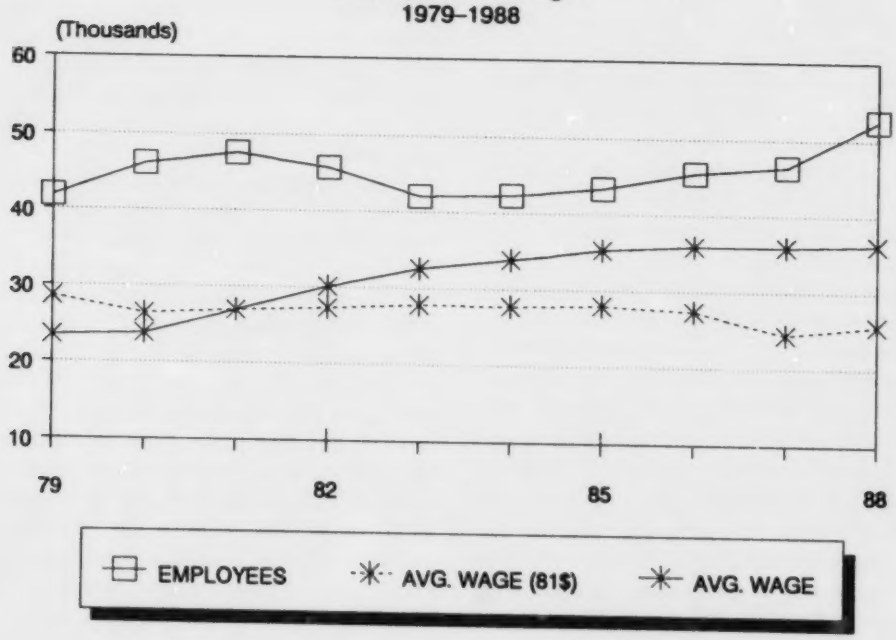
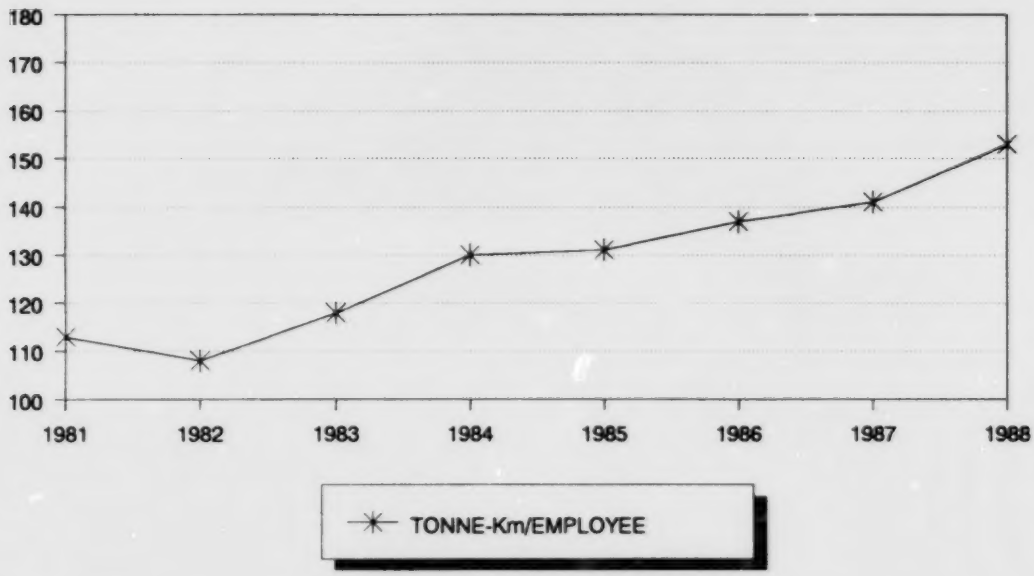


Figure 3–4
Employee Productivity
Major Carriers
1981–1988



b) *Productivity*

Labour costs in the Canadian airline industry are related to the price or wage rate paid and to labour productivity (as measured by tonne-kilometres per employee). The average annual wage (measured in real terms) of employees of Canadian carriers, levels 1 to 3, declined from 1981 to 1987. For the same years, productivity increased from 125 to 143 tonne-kilometres per employee (an average rate of 2.3% per year). The net result was that labour costs in the Canadian airline industry were reduced by 4.1% annually during this period. Figure 3–4 shows recent levels of employee productivity experienced by Level 1 Canadian carriers.

Recent wage settlements in the Canadian airline industry have been at or near the rate of inflation. This trend is expected to continue through 2003. Productivity gains from staff reductions are expected to continue through 1998, although at a reduced rate of 3.0%. From 1998 to 2003 no productivity gains are anticipated. An annual average decline of 2.9% in real labour expense is expected through 1998, but from then until 2003 labour expense will remain static in real terms. Anticipated labour expense changes (net effect of wage rate increases and productivity gains) are shown in Figure 3–5.

c) *Fuel Price*

The price of fuel is a key element in the cost of operating an airline. From a high of over 30% in 1981, fuel costs had declined to about 15% of operating costs at the beginning of 1990. Carriers had grown used to gradually declining real prices and had become more efficient in their consumption by using newer aircraft and by modifying operating procedures. Sharp increases in fuel costs in the latter half of 1990 have required carriers to increase fares and cut unprofitable routes.

Although there may be short-term fluctuations in the price of petroleum, based on past price behaviour, the forecast assumed that over the long term the real price of aviation turbo fuel would remain stable. After the forecast was prepared, the Gulf crisis developed, crude oil prices became volatile and there is uncertainty for current fuel prices.

During the last 20 years world, crude-oil prices have gone through low periods ($2.63 U.S. per barrel in 1973) and high periods ($34 in 1982) characterized by sudden shifts. Turbo fuel prices have historically followed suit, as shown in Figure 3–6 below. In early 1990, turbo fuel prices paid by commercial users seemed to be at a middle level, and the long-term forecast is for prices to increase at or near the rate of inflation. In constant-dollar terms, this is foreseen

Figure 3–5
Labour Expense Forecast
Average Annual Growth Rate (%)

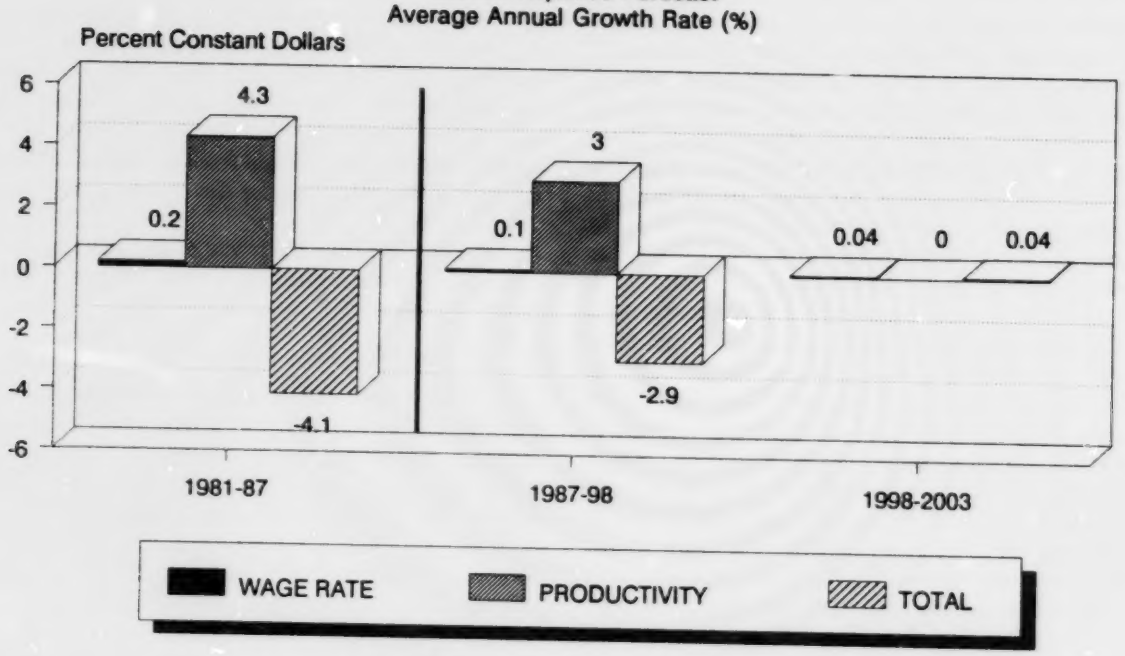
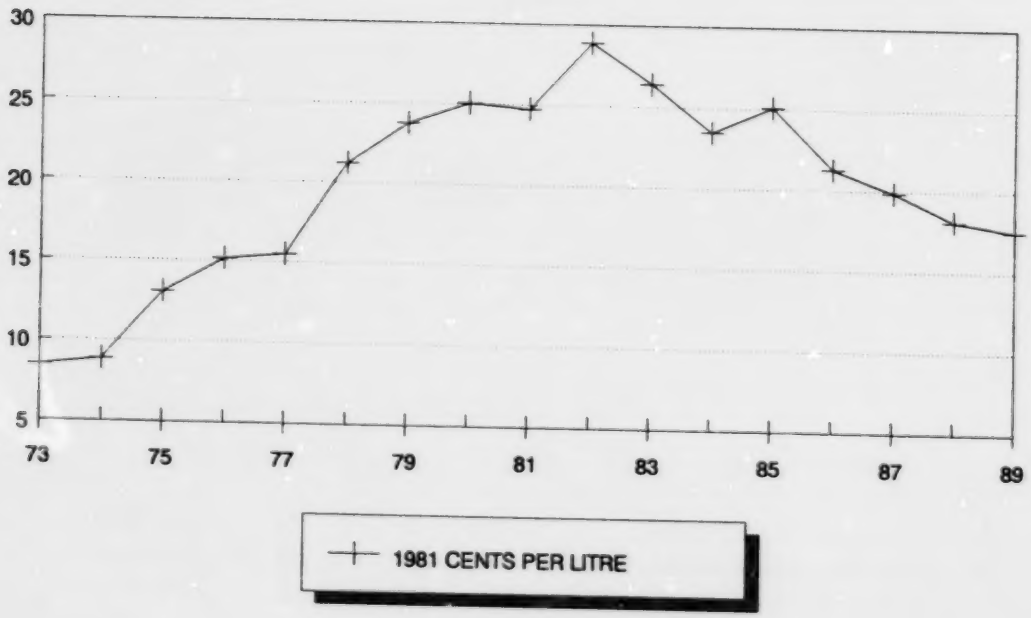


Figure 3–6
Aviation Turbo Fuel
Unit Price—Historical
1973–1989



as an average decrease of 0.7% from 1989 until 1998 and then an increase of about 0.7% above the rate of inflation through the year 2003.

In addition to the influence of changes in the world price of crude oil, the price that airlines pay to refineries for turbo fuel could change if there are fluctuations in intermediate factors in the supply chain. These factors include the exchange rate between Canadian and U.S. dollars; refiners' margins covering costs of production and profit; government taxes; and the degree of change in the price of turbo fuel relative to overall price changes in the Canadian economy.

Our 1988 forecast called for 2.1% annual growth in the real prices of commercial aviation fuel from 1987 until 1996 and 2.4% annual growth from 1996 to 2001. The change in forecast results principally from the use of a different base-year and from a change in expected price increases. The 1988 forecast had a 1985 turbo-fuel base price of 24.7 cents (1981) per litre whereas the 1990 forecast uses a 1987 base of 19.9 cents per litre. Previously, the expected annual rate of increase had been in line with the observed rise in real price from 21.0 cents in 1986 to 22.4 cents in 1987. In fact, from 1987 to 1989 the real price of turbo fuel dropped to 17.5 cents, and the outlook in the spring of 1990 for the short term was for real-price reductions rather than increases.

Other factors contributing to the lower forecast for the cost of fuel are the expectation of a higher exchange rate for the Canadian dollar and the net benefit that commercial users of turbo fuel will derive from the elimination of the 13.5% manufacturers' sales tax and from the introduction of refundable tax credits under the Goods and Services Tax in 1991.

Figure 3–6 shows historical prices and Figure 3–7 indicates forecasted prices of turbo fuel in constant (1981) dollars.

d) *Fuel Efficiency*

Airlines have the option of reducing expenditures on fuel by using aircraft having lower operating costs per available tonne-kilometre. This strategy has manifested itself in purchases of new, more fuel-efficient jet aircraft, which can be used profitably in a greater variety of circumstances, and in the use of smaller turboprop equipment able to serve lower-density feeder routes with greater frequency and reduced operating costs. The major Canadian carriers have committed themselves to large capital

Figure 3–7
Aviation Turbo Fuel
Unit Price Forecast

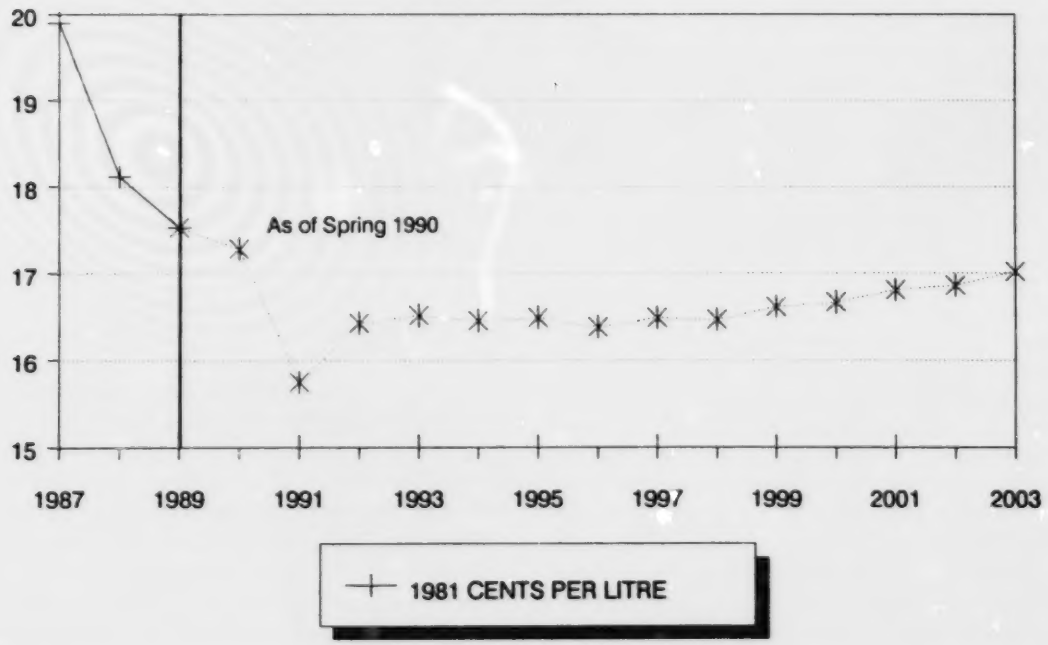


Figure 3–8
Fuel Efficiency—Historical
Level 1 Carriers

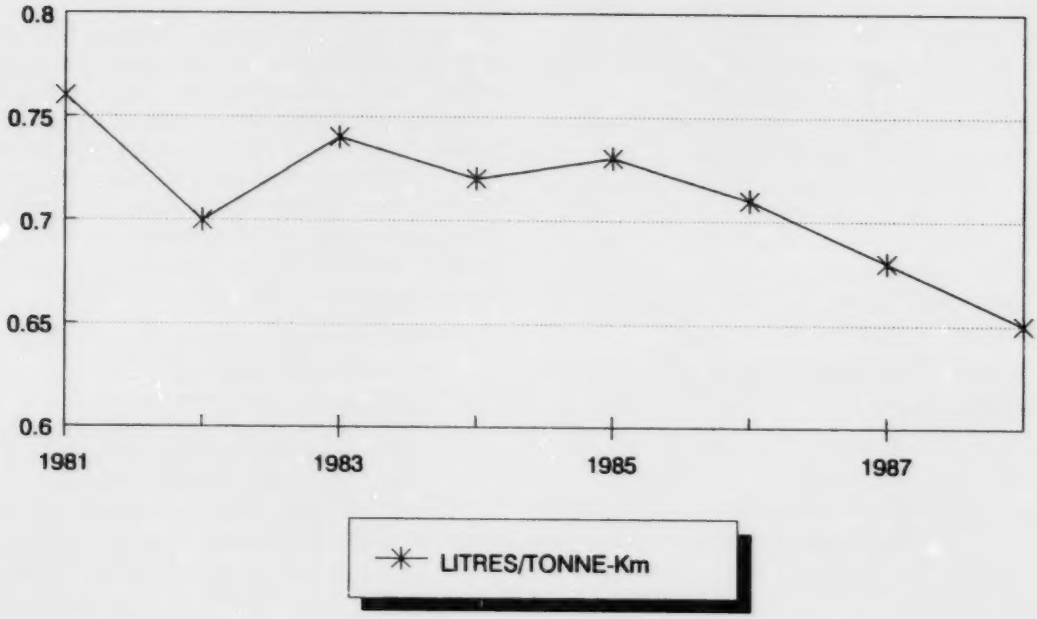
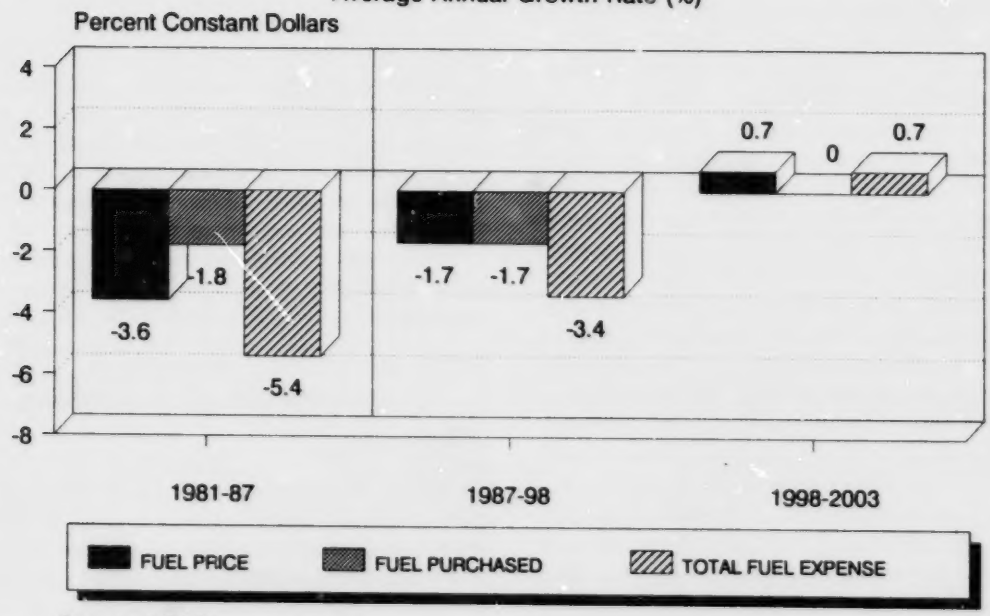


Figure 3–9
Fuel Expense Forecast
Average Annual Growth Rate (%)



Source: ACAC

expenditures to replace ageing and less-efficient aircraft and have turned to affiliated companies to operate services with smaller aircraft on connecting local and regional routes. Figure 3–8 shows historical industry trends in fuel efficiency as measured in number of litres consumed per tonne-kilometre flown.

Gains in fuel efficiency are expected to continue during the early 1990s as new aircraft are delivered and put into service and older equipment is retired. Fuel efficiency can be expected to level off in the late 1990s. The historical and forecast effects of changes in fuel price and the quantity of fuel purchased, as well as their combined impact, on airline operating costs are shown in Figure 3–9.

e) *Government Charges Affecting Airline Costs*

Canadian airlines pay to aeronautical authorities in Canada and other countries landing fees and navigation fees. For the major Canadian airlines, these fees represented about 2.6% of operating costs in 1988.

In North America, governments also levy air transportation taxes directly on air travellers to help pay for air transport facilities and services. Although these taxes do not add directly to airline costs, except in collection and accounting expenses, they do have an impact on potential airline revenues from non-business travellers. Chapter 3.2.3 discusses the impact of ticket taxes paid by price-sensitive consumers on air travel demand.

Transport Canada currently spends approximately $1.42 billion (1990/91 Main Estimates) annually on its Air Transportation Program. These expenditures cover the costs of the infrastructure, operation and maintenance of airports, the air navigation and control system and aviation regulatory services.

Revenues generated by the Air Transportation Program from federal-government fees, concessions and rentals paid by the airlines, businesses at airports and general aviation and from the Air Transportation Tax paid by passengers are estimated at approximately $1.07 billion.

f) *Capital Costs*

Capital costs in the form of interest paid on long-term debt accounted for 7.9% of operating expenses of Canadian Level 1 carriers in 1988. With large borrowings necessary to finance the acquisition of new aircraft, the major carriers can expect to see real interest expense increase at 2.0% annually until 1998 and at 0.5% from 1998 to 2003.

g) *Other Costs*

In addition to the costs of labour, fuel and government fees, airlines incur other operating expenses, which accounted for almost 45.3% of the total for Level 1 carriers in 1988. These other costs include fixed costs such as insurance, and depreciation and variable costs such as sales and passenger service. Depreciation of the value of assets is expected to increase at 0.6% annually until 1998 and to remain steady after that. Specific factors contributing to this trend are as follows:

- greater value of assets as new equipment is acquired;
- higher sales costs (advertising, commissions, promotions such as frequent-flyer programs, and reservation systems) as airlines explore and expand linkages with other countries and other carriers in an increasingly more competitive multinational marketplace; and
- an increase in hull and liability insurance costs as new aircraft are acquired and insurance industry rates rise.

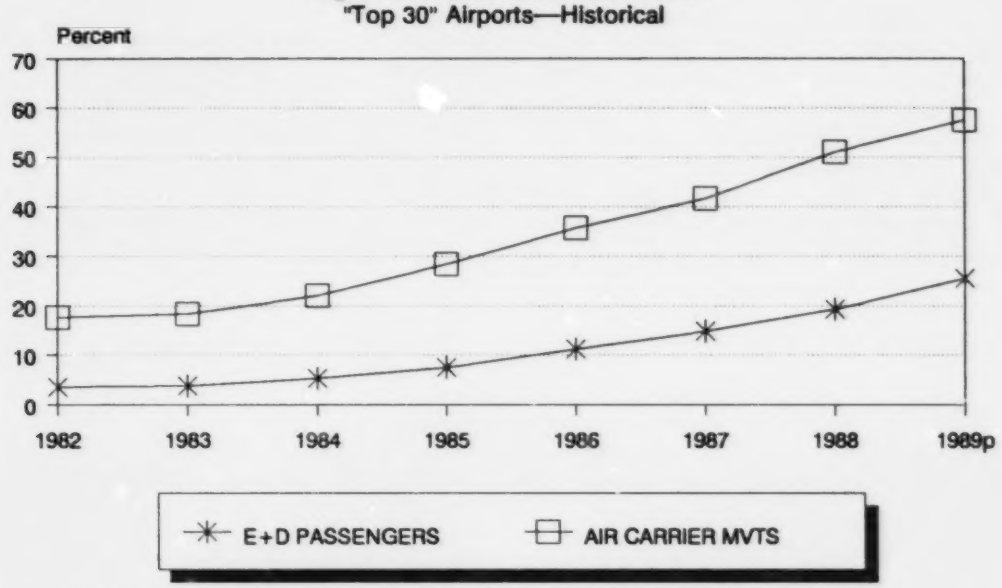
It is interesting to note that airlines have recognized the potential for substantial increases in the costs of frequent-flyer programs. Cost increases began to loom when carriers competed for market share by offering up to six times the normal travel points for certain trips. Frequent-flyer programs have been refocussed to retain the loyalty of frequent business travellers rather than to attract additional occasional discount flyers. Restrictions on the availability and use of bonus travel mean that a substantial proportion of travel points will never be redeemed and those that are redeemed will be managed to preclude travel during peak periods and to accord with limited capacity made available to non-paying passengers.

3.1.3 Operating Strategies of the Canadian Airline Industry

a) *Networks*

Since the introduction of economic regulatory reform in 1984, there has been a gradual restructuring of the air carrier industry in Canada. Air Canada and Canadian Airlines have bought or acquired interest, sometimes dominant interest, in regional and local carriers across the country. The acquisition

Figure 3–10
Regional & Local % of Total Traffic*
"Top 30" Airports—Historical



** Total traffic comprises Domestic Major and Regional/Local carriers.

of Wardair by Canadian Airlines served to reduce excess capacity on long-haul segments. To make more efficient use of large jet aircraft on trunk routes, the major airlines have realigned part of their systems to hub-and-spoke networks. These networks feed traffic from low-density, short-haul routes operated by regional and local carriers using smaller turboprop aircraft to major hub airports. At hub airports the two mainline carriers consolidate traffic on larger jets to carry passengers to their final destinations. Figure 3–10 illustrates the increasing importance of regional and local carriers as measured by their proportion of total domestic passengers and aircraft movements.

The forecast assumes that there will (continue to) be two national carriers who, in co-operation with their regional affiliates, will compete directly on all major routes in southern Canada.

In the domestic sector, trunk routes, defined here for convenience as those interconnecting Canada's eight major hubs (Vancouver, Calgary, Edmonton, Winnipeg, Toronto, Ottawa, Montréal and Halifax) are expected to see more extensive competition, with frequency becoming a major factor.

Although the preceding assumption implies that there will be a lower level of hubbing, particularly in Toronto, on trans-continental trunk routes, the importance of regional hubs will increase, and some newer regional and subregional centres may experience a substantial growth in aircraft movements.

The trend of increase in regional and local carriers' share of domestic traffic is expected to continue as the major carriers turn low-density domestic routes over to their affiliates, some of whom already operate jets in the 85-seat range. However, it is assumed that the most significant changes have already occurred.

In the transborder sector, a fully-integrated North American market, although a possibility, is not envisaged in this forecast. However, direct non-stop service is expected to increase under demand-induced pressures and under freer entry and more flexible pricing as the Canada-U.S. Trade Agreement takes effect.

Internationally, the networks of the two major Canadian carriers continue to evolve. Four major developments in recent years have significantly altered the manner and extent of international market coverage by the two major airlines. The first was the October 1987 decision by the federal government to alter the 1973 air policy, which had divided access to world air travel markets between Air Canada and Canadian Airlines International. The

Table 3–2
Airline Equipment Forecast
(Canadian Scheduled Carriers)

AIRCRAFT CLASS # OF SEATS	REPRESENTATIVE AIRCRAFT TYPES	NUMBER OF ACTIVE AIRCRAFT IN FLEET		
		1987	1998	2003
20– 99	EMB123, HS748, Dash, F100	181	359	389
100–149	DC9, B737, B727, A320, X125	131	160	190
150–249	B767, A310	14	61	84
250 +	DC10, L1011, B747	43	55	65
Total		369	635	728
Average Aircraft Size		99	103	109

SOURCE: World Airliners Order Backlog, Fleet Report.

1987 decision served to encourage competition among Canadian carriers on international routes.

With this revised territorial alignment, Air Canada acquired the right to seek access to new markets in the Pacific, namely South Korea, Malaysia, Burma, and the Philippines, as well as the rights transferred from CAIL to serve Spain and Portugal.

Canadian Airlines became the designated carrier from Western Canada to Munich and Frankfurt, Germany and assumed the dormant rights to points in Europe such as The Netherlands, Italy, the U.S.S.R., Sweden, and Denmark. The decision also allowed CAIL the rights to serve Mexico as well as Central and South America, with the exception of Venezuela, which became an Air Canada destination.

The second major development was CAIL's acquisition of Wardair. This move strengthened CAIL's position in obtaining designation to the U.K. and France. As route authorities are not transferable, CAIL recently applied on its own behalf to the federal government and was granted designation to serve Britain and France and thereby the opportunity to compete with Air Canada.

The third factor has been the dramatic increase in the use of twin-engine aircraft on international routes. This represents a clear attempt by air carriers to use equipment appropriate to the needs of particular markets.

The fourth major factor is the current airline strategy of international expansion by establishing linkages with foreign airlines so as to offer global service within an airline family of operating companies. Commercial agreements between and among carriers now offer international travellers a range of carrier and route possibilities formerly not available.

b) *Average Aircraft Size*

With the advances in technology and the growth in the air industry, there has been a continuous historical progression toward larger aircraft due to the drive for increased productivity. This trend has changed recently as a result of increased competition, which has forced carriers to provide higher frequencies with smaller aircraft on the high-density routes, and the growth of regional and local carriers operating smaller aircraft on the low-density routes.

Given the growing traffic demand, the air carriers will require additional aircraft. Based on discussions with the Canadian air carriers, our expectation is that between 1989 and 1992 their active fleet will increase by over 100 units, or about 25% (these figures do not take into account aircraft retirements). Much of the increase will result from A-320 purchases by both majors.

For the long run, it has been assumed that, despite the current trend toward smaller aircraft, the major air carriers will eventually resume acquisition of larger aircraft, and that the average size of the jet transport fleet will increase slightly over the forecast period. Similarly, the regional and local carriers are expected to re-equip and expand with larger aircraft. The fleet forecast is presented in Table 3–2.

Recent changes, along with the forecasts, for the available seating capacity of aircraft used by the major, and regional and local carriers, are presented in Table 3–3.

Table 3–3
Average Available Seating Capacity
Top 77 Airports

	MAJOR CARRIERS				REGIONAL & LOCAL	TOTAL
	Dom	Tb	OI	All		
1986	118	143	268	127	31	87
1987	117	147	271	127	32	82
1988	126	146	266	135	36	88
1998	139	154	271	150	42	85
2003	141	156	268	152	45	89

SOURCE: Major carriers—Statement 6, Daily Airport Activities Report. Regional & Local Carriers—TC Air Monitoring System.

c) *Load Factors*

Total system load factor is defined as the ratio of total revenue passenger-kilometres to available seat-kilometres. For the major carriers, system load factors have historically been relatively high for scheduled services. This is shown in Table 3–4.

Table 3–4
LOAD FACTORS

	MAJOR CANADIAN CARRIERS	REGIONAL & LOCAL CARRIERS*
1985	66.7	10.9
1986	68.2	12.6
1987	69.3	13.1
1988	69.4	13.4
1998	72.6	17.1
2003	73.9	18.0

* Passengers carried per flight.
SOURCE: Major Carriers—Statement 6, Daily Airport Activities Report. Regional & Local Carriers—Statement 4, System Passenger Origin-Destination Report.

The principal reasons for these high load factors are improved yield management systems, continued discount-fare sales and frequent-flyer programs.

By concentrating on mainline routes, the major carriers hope to avoid the flat spots in traffic and to operate their aircraft at a higher level of profitability than was formerly possible with a mixture of mainline and regional services. Airline yield management systems will be expected to produce slightly higher passenger load factors on domestic routes as newer aircraft are introduced and capacity offered is more closely matched with market demand. Load factors for the transborder sector and the other international sector are also forecast to increase slightly from current levels throughout the forecast period.

Regional and local carriers do not report the data necessary to calculate system load factors. However, the number of passengers carried per flight has been growing for these smaller air services. This growth has been caused partly by the introduction of larger aircraft and partly by the stimulation of demand at faster rates than the addition of capacity. The average number of passengers per flight is expected to continue to grow during the forecast period.

d) *Yields*

Yield is a measure of the revenue received per unit of transportation provided. It is calculated by comparing the passenger revenue generated with the number of revenue passenger-kilometres flown. Historical passenger yields for Level 1 Canadian carriers are presented in Table 3–5.

Table 3–5
Canadian Level 1 Carriers
YIELDS (Cents Per RPK)
($1981)

	DOMESTIC	INT'L	SYSTEM
1985	14.20	9.49	11.94
1986	13.36	9.64	11.57
1987	13.73	9.42	11.60
1988	12.60	7.39	9.87
1989	13.33	8.33	10.38
1998	12.30	9.40	11.60
2003	12.60	9.40	11.60

SOURCE: Statement 10—Unit Toll Transportation Services and Statement 12—Charter Services, Revenue Operating Statistics.

Yields dropped significantly in 1988 mainly because of the availability of discount fares through a price-cutting campaign initiated by Wardair. More recently, yields have increased due to the absence of a low-cost carrier from the marketplace and capacity reductions by the two major carriers.

Domestic-sector passenger yields in real terms are expected to decrease at an average of 0.9% per year between 1987 and 1998.

In the International sector, yields are forecast to remain almost unchanged in real terms between 1987 and 1998 as a result of air fare increases after 1988.

3.2 DEMAND FACTORS AFFECTING THE AIRLINES

3.2.1 Demographic Trends

The average age of Canadians has been increasing and is expected to continue increasing over the forecast period. This phenomenon has little impact on business travel, but is relevant for the non-business segment of the market. The advancement of the "baby boom" generation into the middle years should promote growth in air travel because these are the years of peak income. Additional market growth should come from projected increases in the size of the "over 65" segment of the population.

3.2.2 Demand Plateauing

A key question is whether the demand for air travel will level off at some time in the future. Indications are that, as long as there is continued expansion in the economy, along with increasing disposable income per capita and a growing population, the market for air travel will continue to grow. This presumes that the portion of disposable income directed toward air travel does not diminish as a result of a shift in expenditure patterns to other modes of transport or other areas of consumption.

The trends in propensity to travel by air in both Canada and the United States are shown in Figure 3–11, which compares the two countries' revenue passenger-kilometres flown per capita. Prior to deregulation of the airlines in the U.S. and following the recession in the economy, Canadians travelled more on a per capita basis than Americans. However, from 1982 to 1988 American air travel was greater than Canadian in terms of revenue passenger-kilometres per capita, although the trend increased in both countries during that period.

Spending trends measuring air travel as a percentage of total consumer outlays in Canada and the U.S. show that expenditure on air travel has usually amounted to a higher proportion of total purchases in Canada than in the United States. However, in recent years the gap between the two countries has narrowed. Figure 3–12 compares the Canadian and American histories of expenditure on air travel from 1975 to 1988.

The higher Canadian proportion of spending on air travel may be due in part to the greater distances between metropolitan centres in Canada and the growing interest in travel to remote points in the far North that are served only by air transportation.

The U.S. experience of an increase in per capita air travel (in RPKs) without significant change in air travel's percentage of total consumer expenditures could be interpreted as indicating that incomes are rising as the economy expands and that passengers are better able to afford more or longer air journeys. This would result in a growth in RPKs per capita. However, the fact that growth in air travel in the U.S. has generally been greater than the growth in incomes or in the economy suggests rather that air fares have gone down and the desire to travel has increased.

If the Canadian air travel market is subject to similar influences, then it is reasonable to suggest that Canadian air travel growth could exceed the rate of growth in the economy in general, even if air travel expenditures as a proportion of total spending reach a plateau in the future.

3.2.3 The Impact of Air Transportation Taxes on Demand for Air Travel

The cost of a ticket consists of two elements: (1) the fare charged by the airline; and (2) taxes levied by governments.

For business travellers the additional travel cost imposed by Air Transportation Tax (ATT) is considered to have no influence on demand. However, for non-business tavellers, taxes are not deductible, nor can they be treated as costs to be passed on to clients. In 1991, the Canadian ATT structure will change, and the proposed GST will come into effect. The result for non-business travellers will be increased travel costs and a reduced demand for air travel.

Until the end of 1990, tickets are subject to a Canadian tax of 10% plus $4, to a maximum of $50, for air travel in Canada or between Canada and the continental United States. In addition to the Canadian tax, transborder travellers buying tickets in Canada pay a $6 U.S. tax. Overseas air travellers pay a Canadian tax of $19 per ticket.

In 1991, with the implementation of the Canadian 7% Goods and Services Tax (GST) on the ticketed price (including ATT) of air travel within North America, the Canadian ATT rate will change. For domestic and transborder air travel, the ATT will be 7% of the air fare plus $10, to a maximum of $40.

Figure 3–11
Revenue Passenger-Kilometres Per Capita
Canada vs. U.S.A.
1975–1988

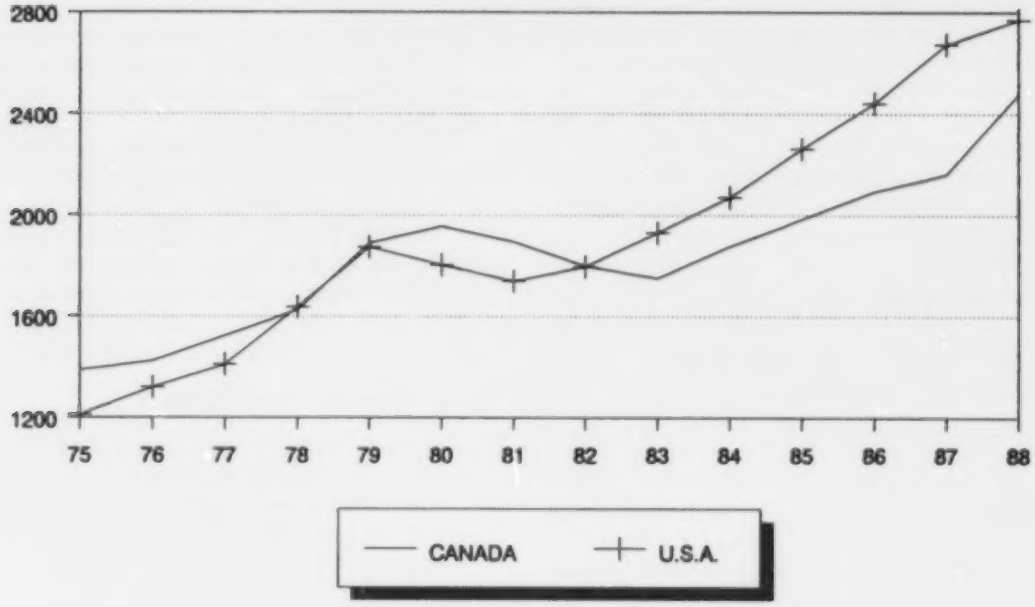
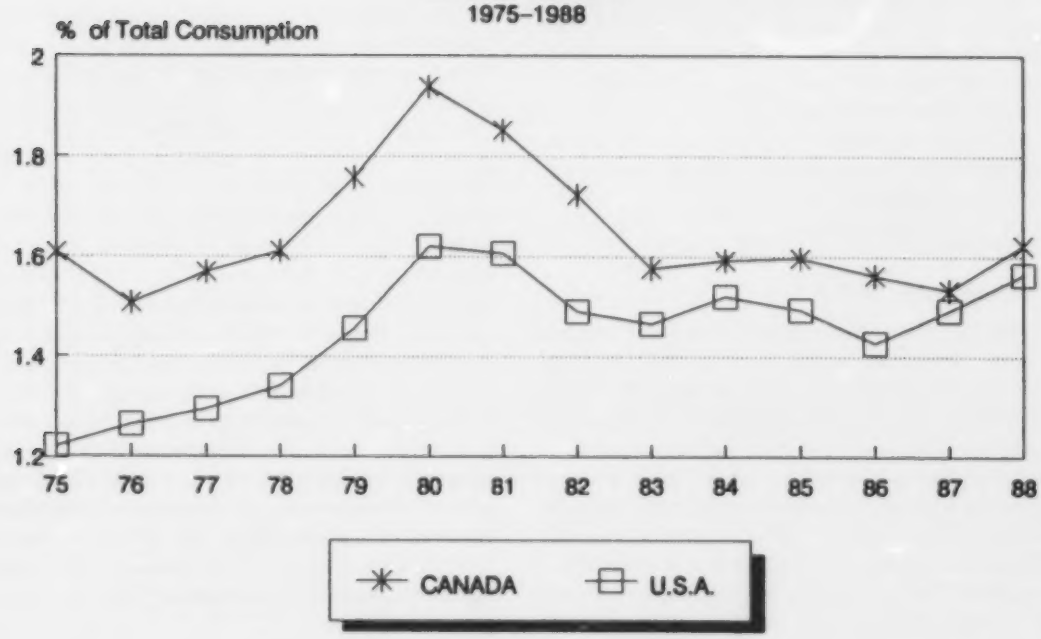


Figure 3–12
Expenditures on Air Travel
Canada vs. U.S.A.
1975–1988



For overseas travel, the ATT will be a flat $40 on purchase of a ticket in Canada or on first enplanement in Canada. Foreign ticket purchases for overseas air travel to Canada will continue to be subject to a Canadian tax of $19 per ticket.

In the United States, tickets for air travel to Canada attract a U.S. ATT of 8% (no maximum) and a reduced Canadian ATT of 5% plus $4, to a maximum of $19. These rates will not change with the introduction of the GST.

The combined impact of these taxes on the demand for non-business air travel has been included in traffic forecasts.

B. GENERAL AVIATION

3.3 SUPPLY FACTORS AFFECTING GENERAL AVIATION

3.3.1 Regulations

The trend toward increased regulation of general aviation (GA) to improve the public perception of safety is likely to continue. GA has a higher accident rate than do the airlines, and the news media devote a great deal of attention to flying accidents and incidents.

Increased airspace management around major airports has made general aviation in these areas more complicated and more expensive. Performance restrictions and reductions in the number of movements permitted per hour at Pearson airport have limited some corporate and small commercial operations in Toronto. Government contemplation of peak-period minimum landing fees at Pearson and Vancouver also suggests that GA will be further constrained in the future as the airlines require priority access to airports.

3.3.2 Costs

a) *Ownership Costs*

By the late 1980s the real cost of general-aviation flying was four times higher than in 1972. A large part of this leap in costs was accounted for by growth in the cost of purchasing aircraft. Manufacturers incurred higher production costs and product-liability insurance costs for small aircraft amd consequently ceased production of formerly popular models.

The short-run outlook for ownership costs is not encouraging. The increasing sophistication of new equipment and higher dealer margins on low-volume sales mean higher prices, which in combination with high interest rates make GA aircraft too expensive for most prospective buyers.

b) *Operating Costs*

General-aviation flying is sensitive to changes in the price of aviation gasoline. Fuel costs are forecast to increase at or near the rate of inflation and slightly faster than economic growth.

Other operating costs such as maintenance, insurance and government fees and taxes are also expected to continue growing.

The variable costs of fuel and maintenance account for an appreciably greater share of total cost for GA than for air carriers; together, fuel and maintenance amount to 60–80% of total GA operating costs.

3.3.3 Aircraft Availability

The 1990 GA fleet of 27,460 aircraft is not expected to grow much in the future. Increasing costs, lack of new small aircraft and the greater complexity of flying in urban areas all combine to dampen interest in adding to the GA fleet.

3.4 DEMAND FACTORS AFFECTING GENERAL AVIATION

3.4.1 Demographic Trends

In the early 1980s, a large part of general-aviation activity consisted of flying training and recreational flying by newly trained pilots. In 1982 there were 23,989 student pilot permits in force, but this number declined to 14,686 by 1990. Historically, those interested in learning to fly have come from the 20-to-30 age group and particularly from the 20-24 bracket. Despite the present trend of diminishing numbers of persons aged 20-24 years, even in the year 2000 this age group will still number more than its approximately 1.8 million members in 1970 when GA was vigorous and growing. Therefore, it seems that the decline in interest in recreational flying is linked less to certain age groups than to other socio-economic factors such as per capita income, employment and the attraction of other recreational activities. These factors are the more likely the cause of the decline in general aviation and particularly the reduction in the number of student pilots. Moreover, it seems likely that in future years these factors will continue to shrink the supply of students and pilots interested in general aviation.

However, not all segments of general aviation are expected to suffer a decline in the number of pilots. The other commercial (aircraft weighing less than 5700 kg) and the corporate sectors of GA are expected to show growth in the number of aircraft movements, and this growth may require an increase in the number of pilots. Airline requirements for experienced pilots may also create openings in corporate GA.

3.4.2 Competition

a) *Business and Corporate GA*

With the proliferation of regional and local air services, some business GA has been attracted to scheduled flights, especially at smaller airports which had previously offered infrequent service. Some areas previously accessible only by local charter service are now linked by road to other communities, and the need for GA flights has thus been reduced. Some specialty general-aviation services such as aerial surveying and patrol are now being done by remote sensing from satellites.

b) *Recreational GA*

There has been a tendency for potential recreational flyers to spend their discretionary income and leisure time on less-solitary and less-regulated pursuits. Emphasis on family-oriented leisure has promoted steady growth in sales of recreational vehicles and boats during the 1980s while private GA activity has dwindled.

4. PASSENGER TRAFFIC FORECASTS

Enplaned-and-deplaned (E&D) passenger volumes are a critical indicator of demands on airport facilities and services. This chapter provides forecasts of E&D activity at Canada's "Top 77" airports and a national forecast for revenue passenger-kilometers (RPKs), a complementary indicator of passenger demand that measures distance travelled as well as numbers of travellers. The "Top 77" airports were selected primarily for their significance in terms of passenger volumes and account for about 96% of total passenger movement in Canada.

4.1 RECENT HISTORY

4.1.1 Enplaned-and-Deplaned Passengers

Total air passenger traffic growth in Canada is illustrated in Figure 4–1. Historically, traffic growth can be divided into three periods:

- 1963 to 1981—During this period, passenger traffic in Canada was stimulated by strong economic growth coupled with advancing air transport technology and corresponding cost-saving improvements in efficiency. Average annual growth between 1963 and 1980 was 10.5%.
- 1981 to 1983—The recessionary period of 1981–1983 affected all regions of Canada, but particularly Western Canada. Using an index (1963 = 100) to depict passenger traffic growth in the various regions, Figure 4–2 indicates that the strongest growth in the few years preceding the recession took place in the Western and Pacific regions, which subsequently were by far the most affected by the recession.
- 1983 to 1989—This was a period of strong growth, stimulated by strong uninterrupted economic expansion in an environment affected by economic regulatory reform and the large-scale introduction of deep-discount fares for the leisure market. The average annual growth rate between 1983 and 1989 was 5.4%.

Between 1963 and 1989, passenger traffic increased at an annual average rate of 7.5%.

Domestic passengers constitute the largest component, accounting for slightly more than two-thirds (68% in 1989) of total E&D passenger traffic in Canada. Domestic growth closely parallels that of all sectors. Historical and forecast figures are presented in Table 4–1.

Economic regulatory reform resulted in the restructuring of domestic services. Major carriers have turned over most short-haul, low-density services to their regional affiliates. This turnover is reflected in a relatively static performance by the major carriers over the past few years and the rapid expansion of regional and local carriers since 1984. See Figure 4–3.

International passenger traffic has two distinct components: namely, traffic to the U.S. (Transborder Sector) and traffic to countries other than the U.S. (Other International Sector). International traffic accounts for slightly less than one-third (32% in 1989) of the total passenger traffic in Canada, with the transborder and other-international sectors accounting for approximately 20% and 12%, respectively, of total E&D passenger traffic in 1989.

With an average annual expansion of 9.4% between 1963 and 1989, growth for the international sectors was significantly stronger than for the domestic sector. Close economic ties between Canada and the U.S., the attraction of "sunspot" destinations during Canada's winter, and the cultural and recreational appeal of Europe and, more recently, of the countries of the Pacific Rim have all contributed to this strong growth in traffic.

In 1989, almost 38% of all enplanements and deplanements in Canada took place in the Ontario region. Of the remaining traffic, approximately 38% was distributed west of Ontario (Central, Western and Pacific regions) and approximately 24% was distributed east of Ontario (Quebec and Atlantic regions).

Figure 4–1
E&D Passengers—Historical
"Top 77" Airports

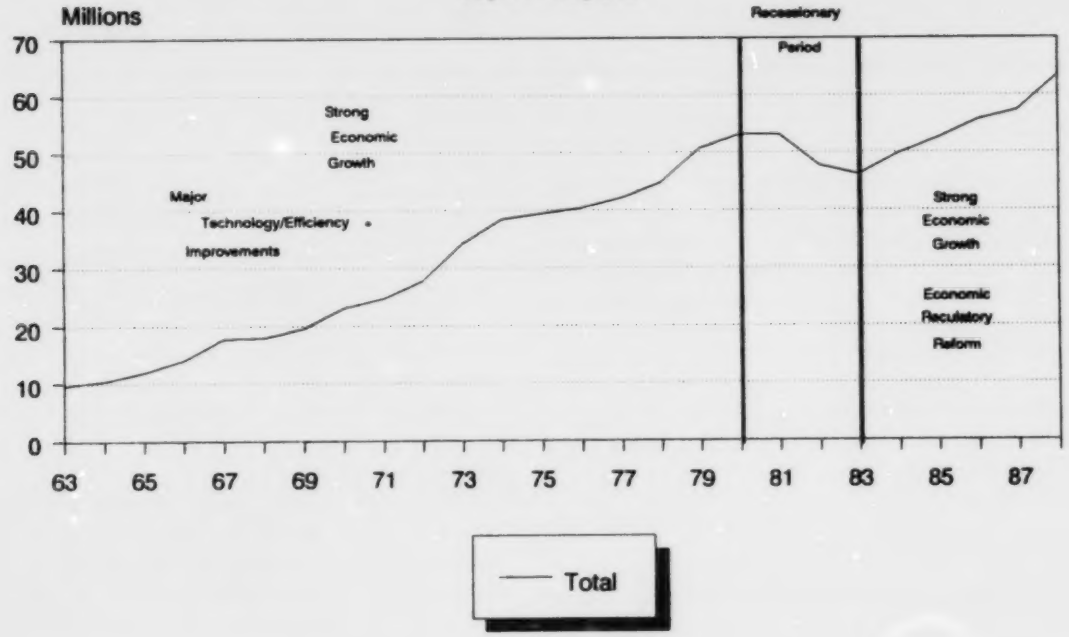


Figure 4–2
E&D Passengers—Historical By Region
"Top 77" Airports
(Index 1963 = 100)

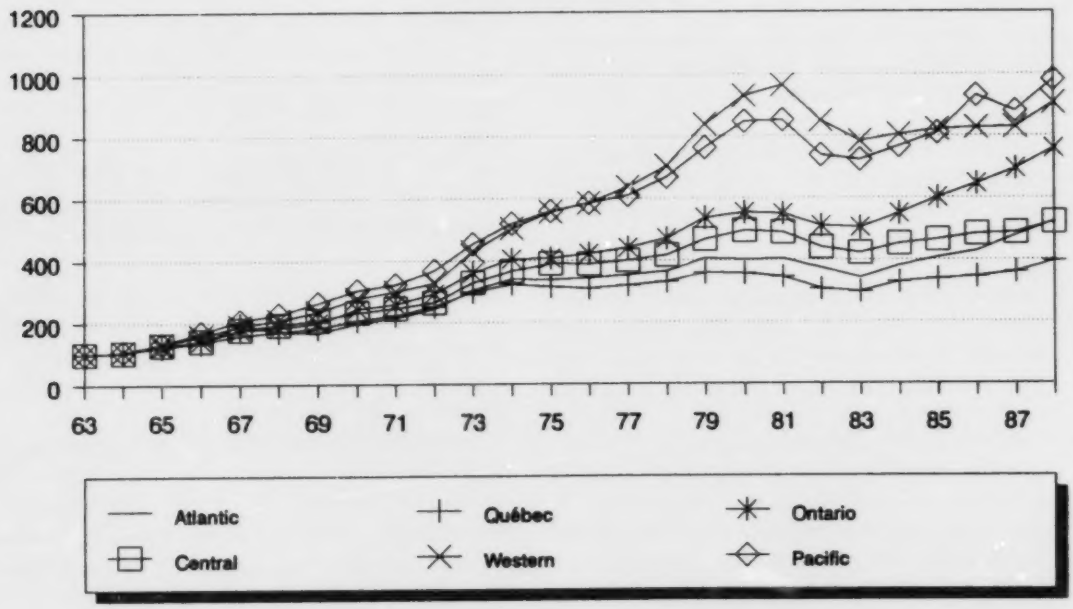


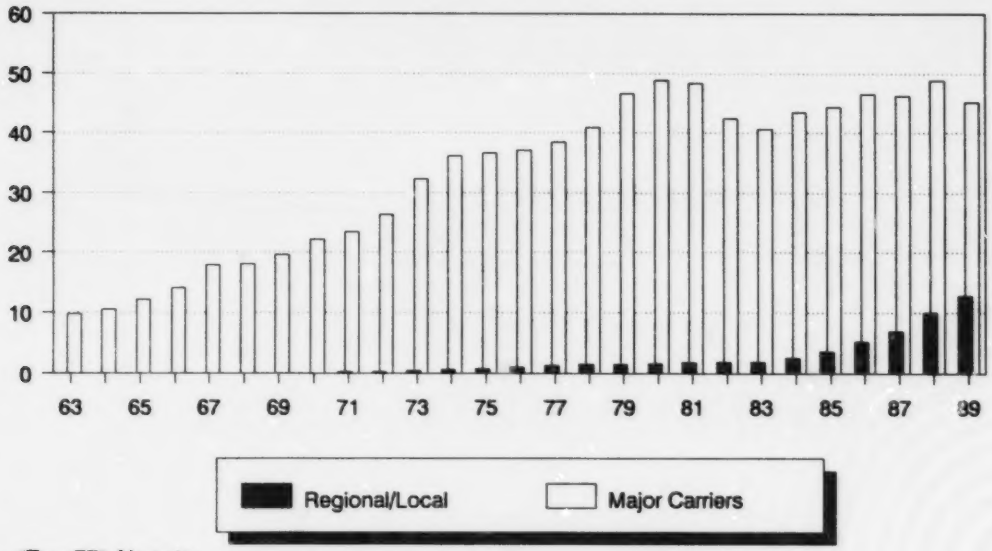
Table 4-1
Enplaned and Deplaned Passengers
BY REGION
('000 000)

	ALL SERVICES ("TOP 77" AIRPORTS)							"TOP 77" AIRPORTS					
								MAJOR CARRIERS			REGIONAL/LOCAL		
YEAR	ATLANTIC	QUEBEC	ONTARIO	CENTRAL	WESTERN	PACIFIC	TOTAL	DOM	TB	OI	CARRIERS	CHARTER	TOTAL
1977	3.137	8.106	14.395	3.483	5.972	6.924	42.017	28.985	6.922	2.484	1.340	2.290	42.021
1978	3.263	8.419	15.371	3.609	6.619	7.529	44.810	30.689	7.530	2.594	1.473	2.560	44.846
1979	3.610	9.112	17.403	4.074	7.885	8.655	50.739	35.332	8.409	2.818	1.543	2.635	50.737
1980	3.599	9.055	17.993	4.307	8.749	9.478	53.181	37.490	8.657	2.680	1.569	2.784	53.180
1981	3.613	8.801	17.903	4.240	9.078	9.539	53.174	37.207	8.617	2.536	1.826	2.987	53.173
1982	3.331	7.796	16.520	3.778	7.973	8.318	47.716	32.370	7.707	2.395	1.835	3.413	47.720
1983	3.031	7.523	16.448	3.649	7.364	8.147	46.162	30.574	7.481	2.468	1.867	3.774	46.164
1984	3.392	8.367	17.934	3.892	7.570	8.675	49.830	32.593	8.014	2.784	2.510	3.929	49.830
1985	3.638	8.550	19.359	4.000	7.716	9.133	52.396	33.439	7.903	3.049	3.573	4.433	52.397
1986	3.804	8.770	20.700	4.164	7.774	10.527	55.739	34.168	9.063	3.273	5.270	3.965	55.739
1987	4.267	9.122	22.158	4.154	7.696	9.894	57.291	33.076	9.306	3.911	6.898	4.099	57.290
1988	4.669	10.105	24.442	4.505	8.520	11.122	63.363	34.633	9.787	4.340	10.010	4.593	63.363
*1989	4.762	10.248	24.285	4.250	8.450	11.327	63.322	30.797	9.731	4.639	12.742	5.414	63.323
1998	6.9	14.6	36.2	6.4	12.0	16.7	92.8	42.0	15.5	7.7	20.0	7.5	92.8
2003	7.8	17.6	44.2	7.4	14.9	19.8	111.6	50.7	18.8	9.8	23.1	9.2	111.6
							AVERAGE ANNUAL GROWTH RATE, %						
1989/98	4.2	4.0	4.5	4.7	4.0	4.4	4.3	3.5	5.3	5.8	5.1	3.7	4.3
1989/03	3.6	3.9	4.4	4.0	4.1	4.1	4.1	3.6	4.8	5.5	4.3	3.9	4.1

* preliminary

NOTE: From 1985 on, the TOP 30 series and the Regional Summary series differ slightly due to the use of E+D charter data versus O+D charter data.

Figure 4–3
Historical E&D Passengers
Regional/Local vs. Major Carriers



"Top 77" Airports

Passenger growth during the entire historical period varied significantly from region to region in Canada. The highest growth was observed in the west, with the Pacific and Western regions experiencing average annual growth rates of 9.2% and 8.8%, respectively. The Ontario region's growth rate of 8.0% was followed by 6.6% in the Atlantic region, 6.3% in the Central region, and 5.5% in the Quebec region. The regional rates are listed in Table 4–2.

Table 4–2
"Top 77" Airports
Enplaned-and-Deplaned Passenger Growth (%)
BY REGION

REGION	1963–1989	1983–1989
Atlantic	6.6	7.8
Québec	5.5	5.3
Ontario	8.0	6.7
Central	6.3	2.6
Western	8.8	2.3
Pacific	9.2	5.6

More recently (1983–1989), the Atlantic region experienced the strongest growth at about 7–8% per annum, followed by the Ontario region at 6.7%. The Quebec and Pacific regions grew at approximately 5.5% while the Central and Western regions tallied 2.6% and 2.3%, respectively.

4.2. NATIONAL PASSENGER FORECASTS

4.2.1 Enplaned-and-Deplaned Passengers

The updated forecasts presented in this report reflect the set of specific assumptions presented in the earlier sections. Although the long-term outlook for the domestic sector remains similar to that developed in the last (1988) forecast update, the present update envisions dramatic changes in the international component of the passenger traffic. The forecasts by sector are presented in Table 4–1.

Overall growth at Canada's "Top 77" airports is expected to average 4.3% annually between 1989 and 1998 and 4.1% annually between 1989 and 2003. The forecast is illustrated in Figure 4–4.

The forecast for domestic passenger traffic growth is presented in Figure 4–5. There is strong evidence that the rapid expansion of regional and local carriers in recent years is largely complete. The share of E&D passengers handled by the local and regional carriers is expected to increase slightly in the short term, but then level off at slightly over 30%. Regional and local carriers' traffic growth is

Figure 4–4
E&D Passengers (Total)
"Top 77" Airports
1963–2003

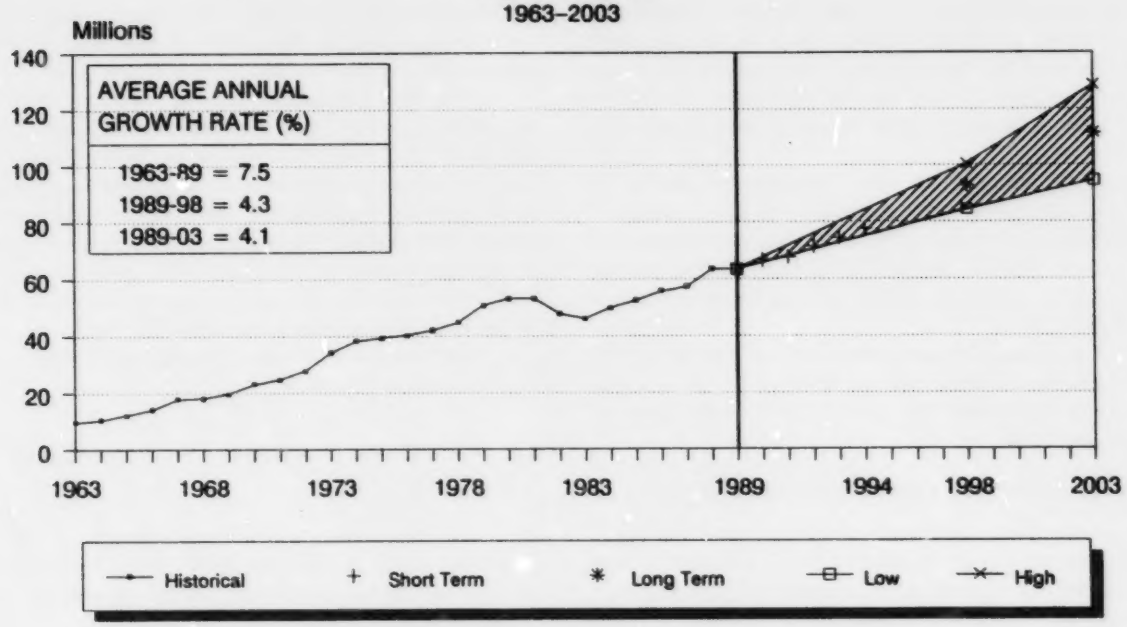
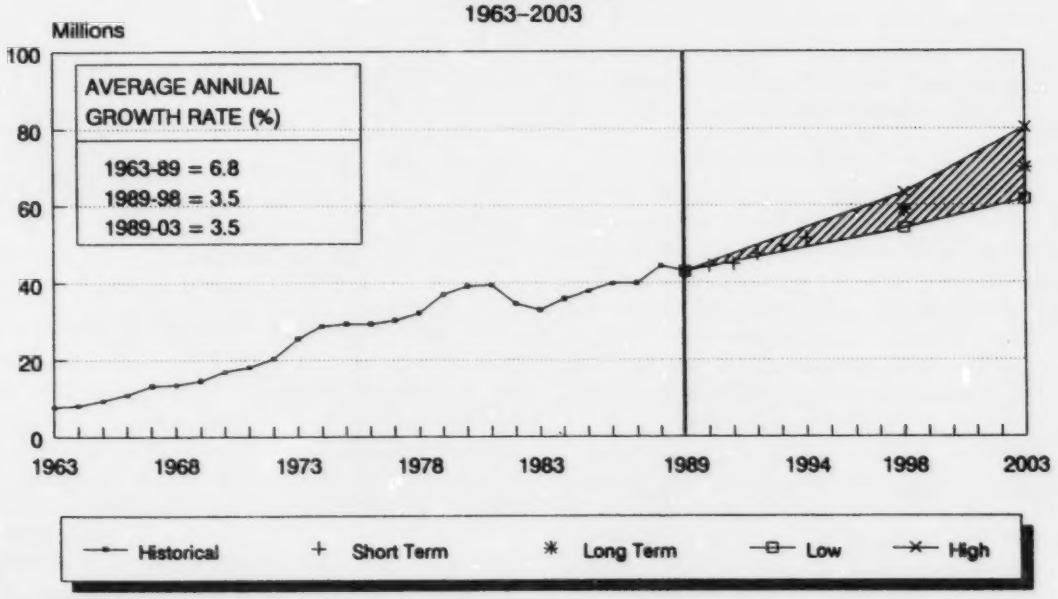


Figure 4–5
E&D Passengers—Domestic*
"Top 77" Airports
1963–2003



**Major, R/L, Charter Carriers

expected to average 5.1% annually between 1989 and 1998 and 4.3% between 1989 and 2003.

The forecast international passenger traffic is presented in Figure 4–6. The forecast reflects the expectation of major changes, such as an integrated Europe by 1993, the effects of the Canada-U.S. trade agreement and an increase in transpacific traffic to the U.S. as a result of the boom in the Asia/Pacific economy.

With respect to the transborder traffic, a fully integrated North American market, though a possibility, is not envisaged in the forecast. However, it is expected that freer entry and more flexible pricing will further stimulate traffic growth between Canada and the U.S.

International passenger growth at Canada's "Top 77" airports is expected to average 5.9% annually between 1989 and 1998 and 5.2% annually between 1989 and 2003.

4.2.2 Revenue Passenger-Kilometres

A passenger-kilometre represents the transportation of one revenue-paying passenger for a distance of one kilometre. By combining a measure of distance travelled with the number of passengers travelling, revenue passenger-kilometres effectively measure the volume of commercial passenger traffic carried by the airlines.

The number of RPKs reported by Canadian Level 1 carriers for their scheduled and charter operations combined accounts for about 98% of all RPKs reported by Canada's commercial air carriers (Level 1–4).

RPKs for Canadian Level 1 carriers are expected to increase from 46.9 billion in 1989 to 71.1 billion in 1998 and 88.6 billion in 2003. These increases reflect the relatively large growth in international traffic forecast for the entire 1989–2003 period. This sustained growth in RPKs translates into an average annual increase of 4.7% up to 1998 and 4.6% subsequently, which is approximately 0.5% higher than the forecast growth rate for E&D passengers. The forecast for revenue passenger-kilometres is presented in Figure 4–7.

4.3 REGIONAL PASSENGER FORECAST SUMMARY

Over the long term, the forecast growth in E&D passenger traffic is expected to be above the national average only in the Ontario region and average in the Pacific and Western regions.

Figure 4–6
E&D Passengers (Transborder & Other International)
"Top 77" Airports
1963–2003

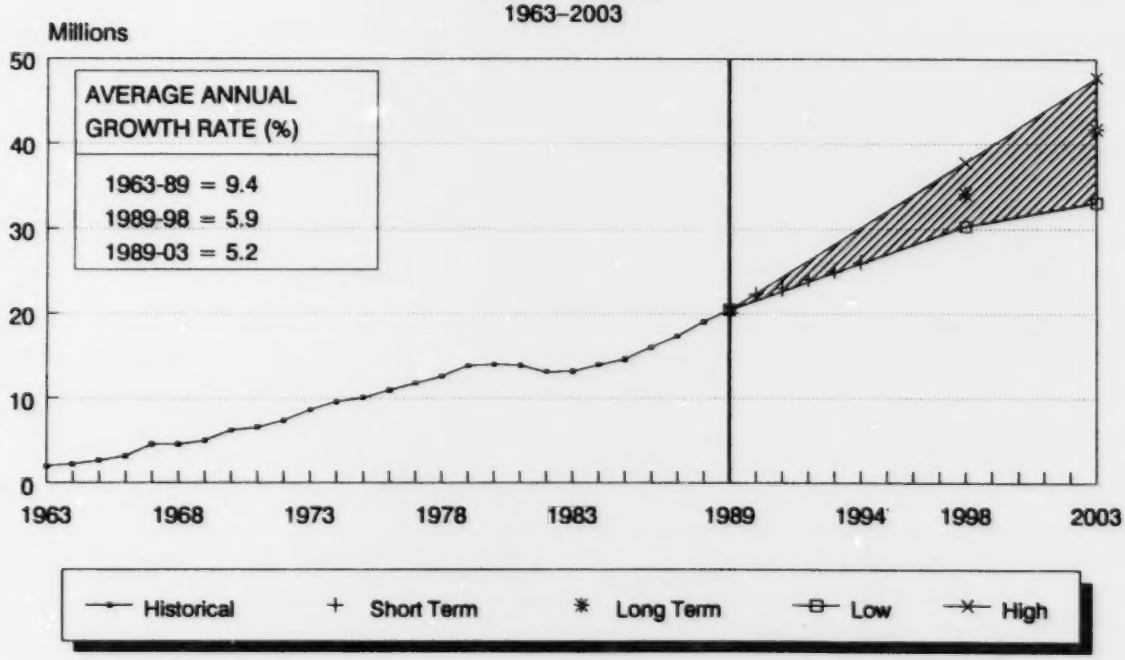
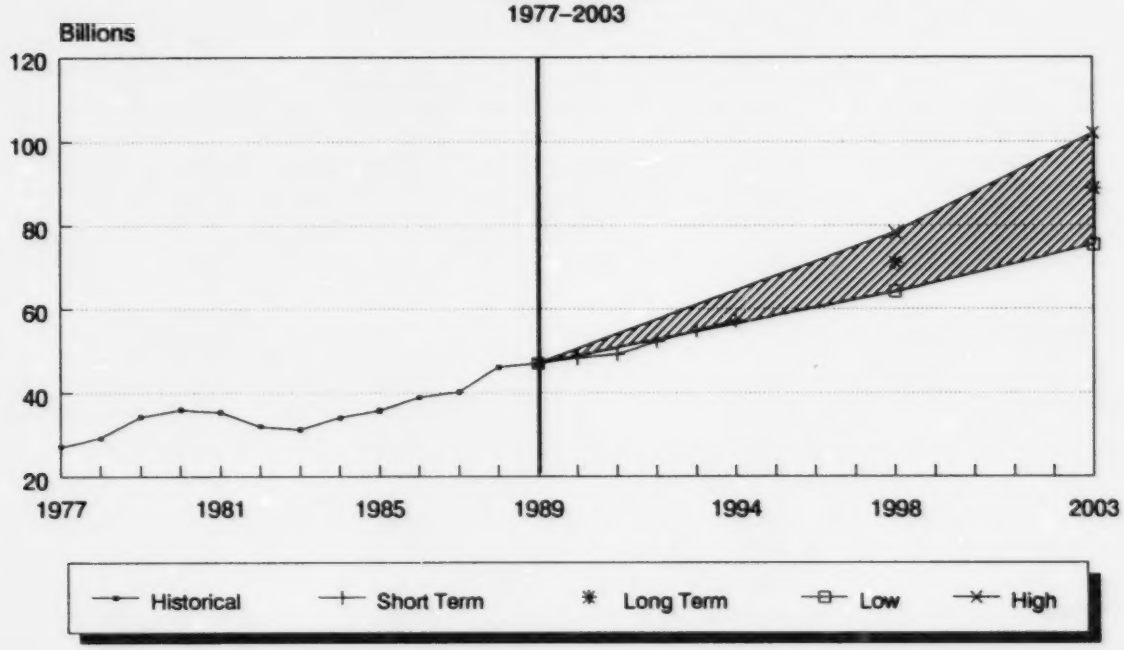


Figure 4–7
Revenue Passenger-Kilometres
Level 1 Carriers
1977–2003



The Atlantic, Quebec and Central regions are expected to experience below-average increases in passenger traffic, reflecting the anticipated distribution of economic growth.

4.4 SITE PASSENGER FORECASTS

4.4.1 Nine Major Airports

The E&D passenger forecasts for the "Top 77" airports are shown in Table 4–3. Detailed forecasts for each of the nine major airports are presented in Figures 4–8 to 4–15. The outlook for each of these airports is discussed below.

Toronto: L.B. Pearson International Airport

Toronto International is by far the busiest Canadian airport, handling almost one-third of all passengers (enplanements and deplanements) at the "Top 77". In 1988, Toronto International ranked 11th among the world's busiest airports in terms of international passenger activity (cf., ICAO's "Top 25 World Airports").

The role of Pearson as a key hub airport in Canada has been further strengthened in recent years by the restructuring of domestic routes in response to economic regulatory reform. This restructuring has resulted in increasing congestion and, since December 1988, a temporary cap on the number of flights permitted per hour.

Enplaned-and-deplaned passengers at Pearson International totalled 20.3 million in 1989. By 2003 this figure is expected to have increased by about 80% to 36.5 million. (Figure 4–8)

Vancouver International Airport

In 1989, Vancouver International Airport ranked second-busiest among the Canadian airports, handling about 14.4% of all E&D passengers at the "Top 77".

The importance of Vancouver International as a key western hub airport is illustrated by the fact that in 1989 Vancouver handled about 1.8 million local and regional E&D passengers, or about 14% of Canada's local and regional passenger traffic.

Vancouver International is expected to experience strong growth in E&D passenger traffic because of its location at the starting-point of tours to Western Canada's major tourist attractions and also because it serves as a gateway to the rapidly growing Pacific Rim market. Vancouver is also expected to benefit as CAIL's major hub for U.S. and Pacific-region traffic.

Table 4–3
Total Enplaned and Deplaned Passengers
(Thousands)

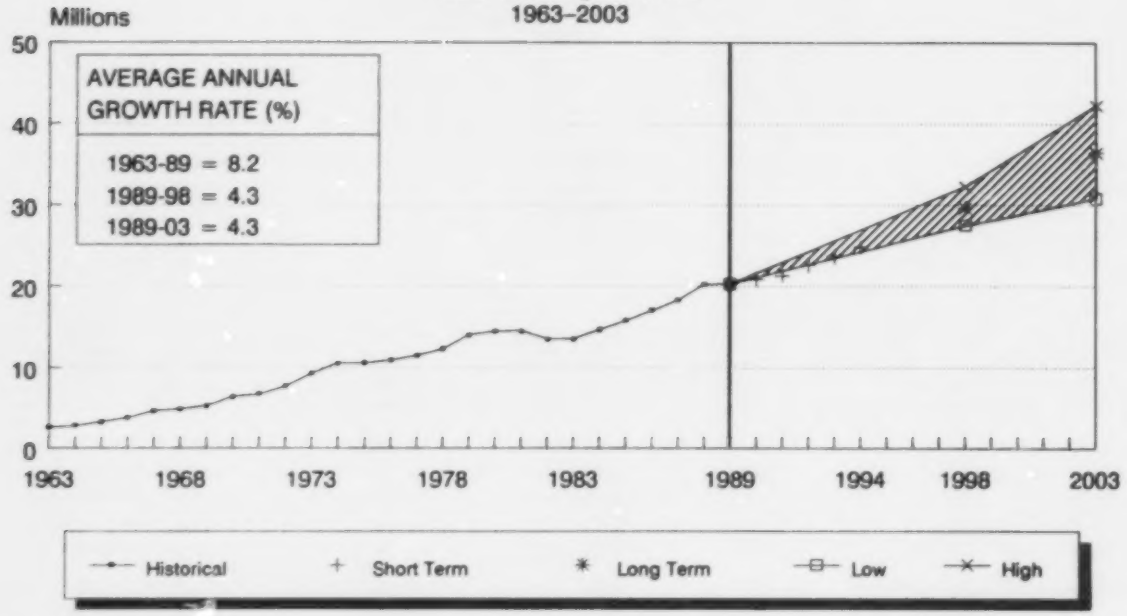
	AIRPORT	1989 TOTAL	1989 PERCENT OF TOTAL	1989 CUMULATIVE PERCENT	1998 TOTAL	2003 TOTAL
1	Lester B. Pearson	20,263.8	32.0%	32.0%	29,699.0	36,499.0
2	Vancouver Int'l	9,143.9	14.4%	46.4%	13,510.0	16,167.0
3	Dorval Int'l	6,455.9	10.2%	56.6%	9,183.0	11,022.0
4	Calgary Int'l	4,475.3	7.1%	63.6%	6,403.0	7,923.0
5	Ottawa Int'l	2,636.1	4.2%	67.8%	4,195.0	5,056.0
6	Mirabel Int'l	2,404.9	3.8%	71.6%	3,452.0	4,233.0
7	Halifax Int'l	2,400.4	3.8%	75.4%	3,672.0	4,188.0
8	Winnipeg Int'l	2,314.4	3.7%	79.0%	3,416.0	3,909.0
9	Edmonton Int'l	1,988.8	3.1%	82.2%	2,945.0	3,740.0
10	Edmonton Mun.	1,029.7	1.6%	83.8%	1,371.0	1,758.0
11	Québec	759.0	1.2%	85.0%	1,109.0	1,304.0
12	Victoria	740.4	1.2%	86.1%	1,069.0	1,253.0
13	St. John's	695.6	1.1%	87.2%	1,061.0	1,188.0
14	Saskatoon	633.3	1.0%	88.2%	973.0	1,141.0
15	Regina	624.8	1.0%	89.2%	947.0	1,112.0
16	Thunder Bay	526.9	0.8%	90.1%	830.0	930.0
17	Kelowna	386.7	0.6%	90.7%	621.0	714.0
18	Moncton	285.7	0.5%	91.1%	348.0	400.0
19	Prince George	269.7	0.4%	91.5%	355.0	393.0
20	Saint John	243.3	0.4%	91.9%	307.0	334.0
21	London	241.1	0.4%	92.3%	468.0	546.0
22	Windsor	230.7	0.4%	92.7%	407.0	476.0
23	Fredericton	223.1	0.4%	93.0%	278.2	324.2
24	Sudbury	220.2	0.3%	93.4%	313.0	348.0
25	Yellowknife	212.0	0.3%	93.7%	256.0	319.0
26	Charlottetown	209.6	0.3%	94.0%	274.0	312.0
27	Sault Ste. Marie	199.2	0.3%	94.3%	326.5	357.5
28	Timmins	184.5	0.3%	94.6%	269.0	295.0
29	Sydney	180.5	0.3%	94.9%	217.0	256.0
30	Deer Lake	163.0	0.3%	95.2%	211.0	218.0
31	Hamilton	149.3	0.2%	95.4%	154.0	188.0
32	Fort St. John	141.7	0.2%	95.6%	169.0	188.0
33	Sept Iles	141.4	0.2%	95.9%	201.0	233.0
34	Kamloops	131.4	0.2%	96.1%	210.0	233.0
35	Gander Int'l	123.8	0.2%	96.3%	169.0	189.0
36	Lethbridge	123.0	0.2%	96.5%	150.0	180.0
37	Whitehorse	123.0	0.2%	96.7%	163.0	194.0
38	Saguenay	122.0	0.2%	96.8%	128.0	145.0
39	Prince Rupert	120.2	0.2%	97.0%	161.0	171.0
40	Val d'Or	115.3	0.2%	97.2%	163.0	183.0

Table 4–3 (Cont'd)
Total Enplaned and Deplaned Passengers
(Thousands)

	1989			1998	2003
AIRPORT*	TOTAL E&D	PERCENT OF TOTAL	CUMULATIVE PERCENT	TOTAL E&D	TOTAL E&D
41 Rouyn/Noranda	107.3	0.2%	97.4%	137.0	156.0
42 Grande Prairie	103.0	0.2%	97.5%	133.0	152.0
43 North Bay	99.6	0.2%	97.7%	172.0	194.0
44 Thompson	98.4	0.2%	97.9%	146.0	160.0
45 Terrace	97.1	0.2%	98.0%	125.0	134.0
46 Castlegar	95.6	0.2%	98.2%	119.0	125.0
47 Cranbrook	94.0	0.1%	98.3%	127.0	135.0
48 Goose Bay	89.2	0.1%	98.5%	107.0	110.0
49 Campbell River	89.9	0.1%	98.6%	126.0	141.0
50 Fort McMurray	87.7	0.1%	98.7%	109.0	122.0
51 Penticton	85.6	0.1%	98.9%	134.0	149.0
52 Inuvik	77.1	0.1%	99.0%	114.0	134.0
53 Wabush	71.3	0.1%	99.1%	103.0	117.0
54 Baie Comeau	66.9	0.1%	99.2%	96.0	111.0
55 Mont Joli	66.1	0.1%	99.3%	112.0	125.0
56 Stephenville	52.9	0.1%	99.4%	81.0	90.0
57 Sarnia	50.9	0.1%	99.5%	80.0	92.0
58 Comox	50.2	0.1%	99.6%	65.0	74.0
59 Sandspit	40.1	0.1%	99.6%	55.0	62.0
60 Port Hardy	36.5	0.1%	99.7%	62.0	72.0
61 Churchill	31.6	0.0%	99.7%	38.0	44.0
62 Dryden	30.1	0.0%	99.8%	50.0	63.0
63 Norman Wells	29.0	0.0%	99.8%	37.0	39.0
64 Hay River	26.5	0.0%	99.9%	33.0	37.0
65 Charlo	24.1	0.0%	99.9%	36.0	40.0
66 Fort Smith	20.9	0.0%	99.9%	25.0	27.0
67 Fort Nelson	14.4	0.0%	100.0%	19.0	21.0
68 Watson Lake	10.4	0.0%	100.0%	15.0	17.0
69 Fort Simpson	8.9	0.0%	100.0%	10.0	11.0
70 St. Hubert	4.6	0.0%	100.0%	80.0	100.0
71 Abbotsford	3.4	0.0%	100.0%	5.1	6.0
72 Uranium City	1.9	0.0%	100.0%	4.0	5.0
73 Springbank	0.0	0.0%	100.0%	0.0	0.0
74 St. Andrews	0.0	0.0%	100.0%	0.0	0.0
75 Langley	0.0	0.0%	100.0%	0.0	0.0
76 Villeneuve	0.0	0.0%	100.0%	0.0	0.0
77 Pitt Meadows	0.0	0.0%	100.0%	0.0	0.0
TOTAL	63,398.9			92,708.8	111,484.7
Toronto Island	283.5	0.4%		900.0	1,100.0

NOTE: 1989 figures are preliminary

Figure 4–8
L.B. Pearson International Airport
E&D Passenger—Total
1963–2003



Enplaned-and-deplaned passengers at Vancouver International totalled 9.1 million in 1989. Passenger traffic is expected to increase by about 78% to 16.2 million E&D by 2003. (Figure 4–9)

Montréal Airport System

Dorval and Mirabel International airports ranked third and sixth, respectively, among the busiest Canadian airports, with about 10.2% and 3.8% of all E&D passengers at the "Top 77".

Historically, traffic growth at the Montréal Airport System was affected negatively by several factors, particularly the major change in airport role. Before 1975 Montréal was, for all intents and purposes, the only Canadian gateway city for transatlantic scheduled flights. However, by 1975 foreign carriers began acquiring landing rights to other points within Canada (in particular, Toronto) and operating direct flights to those cities.

The recessionary period 1981–1983, which had a major affect on all regions of Canada, in the Québec region was compounded by a significant drop in point-to-point service for many regional markets.

In recent years (1983–1988), the Montréal Airport System experienced strong passenger growth, stimulated by the vigorous economic growth in the Province of Québec and a much improved air network system following the restructuring of domestic routes as a result of economic regulatory reform. In 1989, Montréal handled about 1.3 million local and regional E&D passengers or about 10% of all local and regional passenger traffic at the "Top 77" airports.

The anticipated growth in international travel is expected to benefit Mirabel Airport, given the extensive airport infrastructure and the widespread international network already in place there. Dorval airport will benefit from the expected increase in traffic to the United States and will serve as a hub airport for the Québec region. The Montréal Airport System handled 8.9 million E&D passengers in 1989. This total is expected to increase by about 72% to 15.3 million by 2003. (Figure 4–10)

Ottawa International Airport

Ottawa International ranks fifth among the busiest Canadian airports, with 4.2% of all E&D passengers at the "Top 77" airports in 1989.

Historically, growth at the airport has been strong and steady due to the strong economic growth in the Province of Ontario and Ottawa's position as the country's capital and federal administrative centre.

Ottawa is expected to expand its international role with significantly more direct service to the U.S. and to Europe.

Figure 4–9
Vancouver International Airport
E&D Passengers—Total
1963–2003

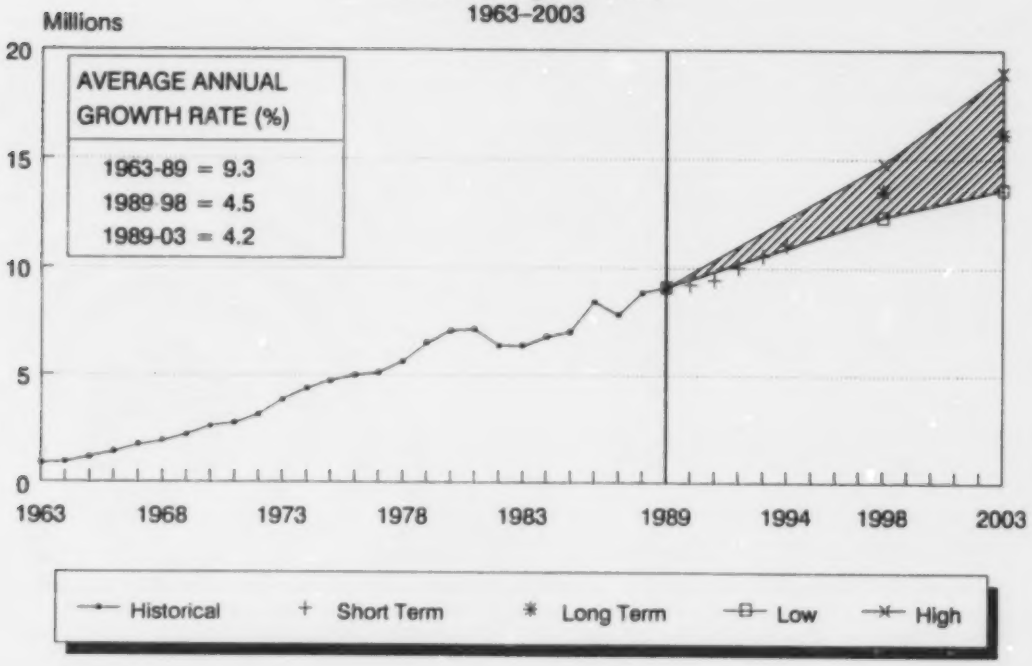


Figure 4–10
Montréal Airport System—Dorval & Mirabel
E&D Passengers—Total
1963–2003

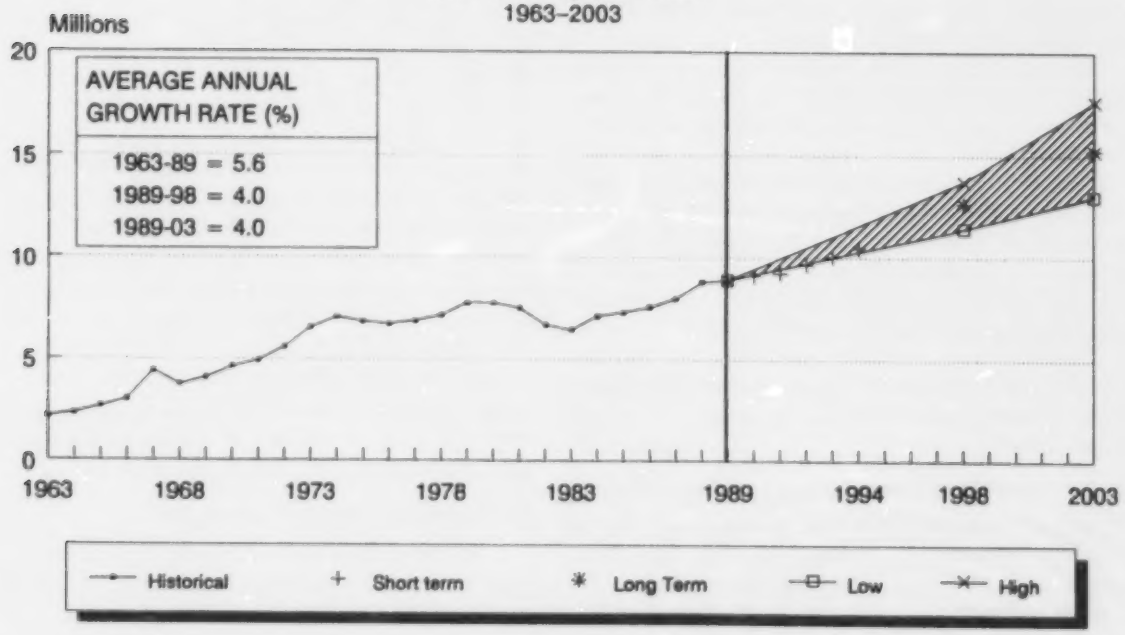
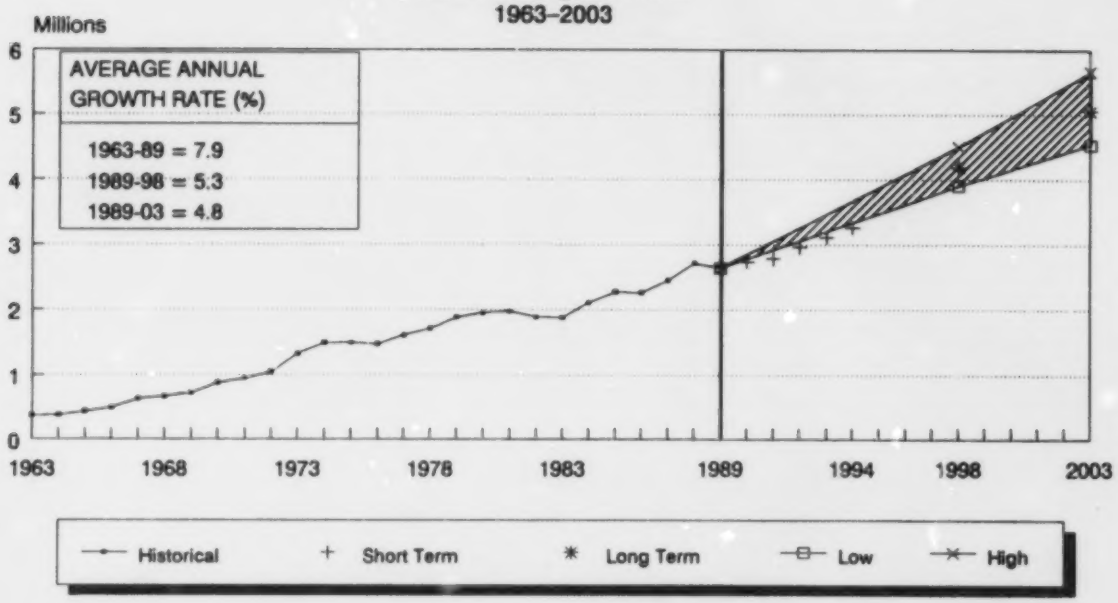


Figure 4–11
Ottawa International Airport
E&D Passengers—Total
1963–2003



E&D passengers at Ottawa totalled 2.6 million in 1989. By 2003 that total is expected to increase by about 92% to 5.1 million. (Figure 4–11)

Halifax International Airport

Halifax International ranks seventh among the busiest Canadian airports, with 3.8% of all E&D passengers at the "Top 77" in 1989.

Recently, Halifax has evolved as the major hub for the Atlantic region. Halifax is expected to maintain this role and to expand its international role with more direct service to the United States and Europe. It is anticipated that Halifax will become the focal point for traffic growth arising from the eventual extraction of offshore oil in the region. In 1989, Halifax handled about 0.8 million local and regional E&D passengers or about 6.2% of all the local and regional passenger traffic at the "Top 77" airports.

Enplaned-and-deplaned passengers at Halifax International totalled 2.4 million in 1989. By 2003, that total is expected to increase by about 63% to 3.9 million. (Figure 4–12)

Edmonton and Calgary International Airports

Calgary and Edmonton International rank fourth and ninth, respectively, among the busiest Canadian airports, with 7.1% and 3.1% of all passengers at the "Top 77" in 1989.

Historically, growth at both airports was affected by pre-recession, energy-related megaprojects. Between 1977 and 1981, air travel at both airports expanded by almost 50%. However, most of that growth was subsequently lost during the recessionary period 1981–1983.

Lately, traffic growth at the Alberta airports has been below the national average primarily due to weakness in the resource sector, particularly the energy sector, of the Alberta economy.

Both airports are expected to expand their international role with more direct service to the U.S and to Europe. Both airports will continue their role as air hubs for Alberta, with Calgary International having an advantage over Edmonton in being Canadian Airlines International's major western hub and operating base.

Enplaned-and-deplaned passengers at Calgary and Edmonton International totalled 4.5 million and 2.0 million, respectively, in 1989. By 2003, E&D passenger traffic is expected to increase by about 77% and 88%, respectively, to 7.9 million and 3.7 million E&D passengers. (Figures 4–13 and 4–14)

Winnipeg International Airport

Winnipeg International ranks eighth among the busiest Canadian airports, with 3.6% of all E&D passengers at the "Top 77" in 1989.

Figure 4–12
Halifax International Airport
E&D Passengers—Total
1963–2003

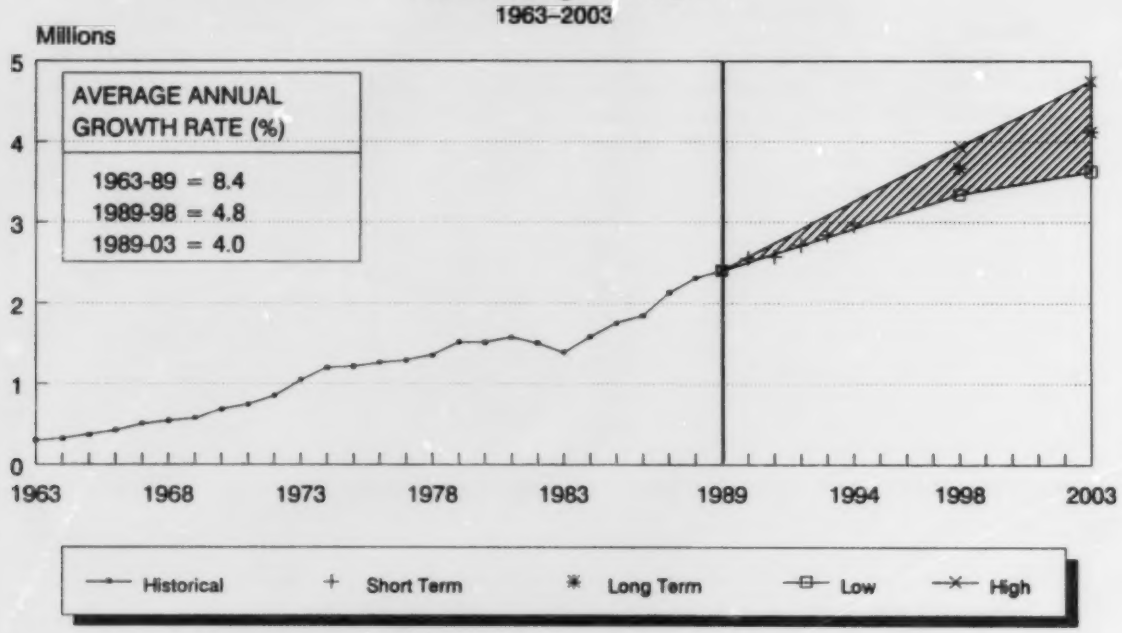


Figure 4–13
Edmonton International Airport
E&D Passengers—Total
1963–2003

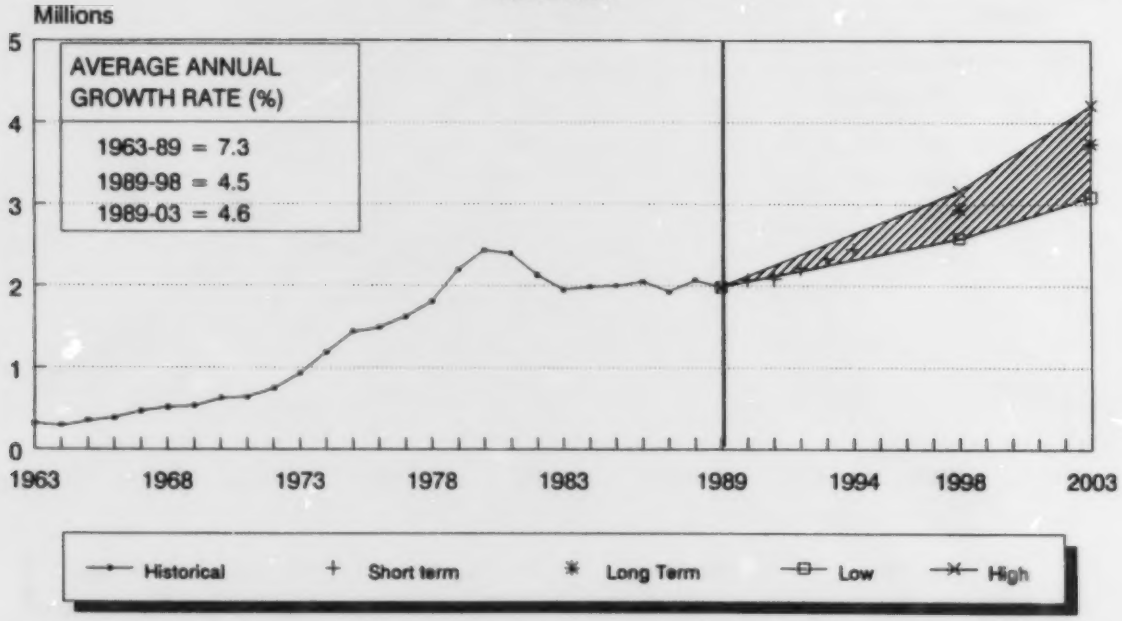


Figure 4–14
Calgary International Airport
E&D Passengers—Total
1963–2003

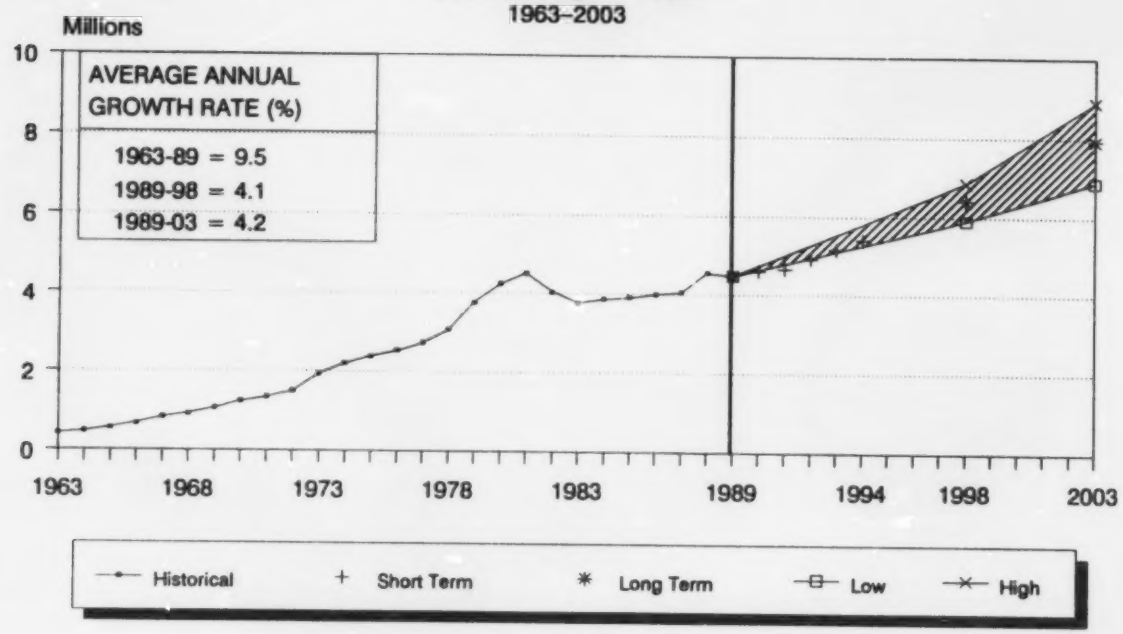
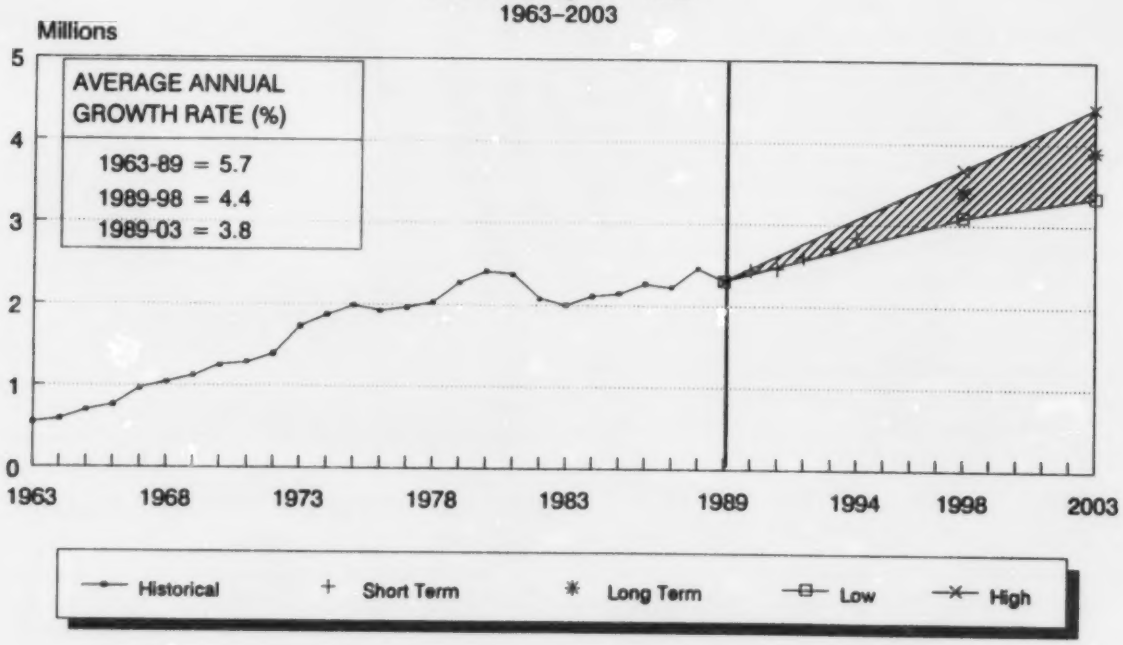


Figure 4–15
Winnipeg International Airport
E&D Passengers—Total
1963–2003



Historically, growth at Winnipeg has been moderate and below the national average.

More recently, the below-average traffic growth at the airport primarily reflects the weak economic growth in Manitoba and Saskatchewan. Winnipeg International serves as the hub for the Central region.

Enplaned-and-deplaned passengers at Winnipeg International totalled 2.3 million in 1989. By 2003, that total is expected to increase by about 69% to 3.9 million. (Figure 4–15)

4.4.2 Other Airports

Table 4–3 also presents the forecasts of E&D passenger traffic at the remaining 68 of the "Top 77" airports, as well as at Toronto Island, for the years 1998 and 2003.

5. CARGO TONNAGE FORECASTS

Total enplaned-and-deplaned cargo for a given site is defined as the total tonnage of revenue cargo (freight and express) loaded at the airport.

This chapter provides E&D cargo forecasts for Major Carrier services and International Charter services at the 30 most important airports in Canada ("Top 30"). These forecasts are most often used in land-use planning for the provision of cargo terminal facilities at airports.

5.1 RECENT HISTORY

Over the past eight years (1980–1988), air cargo traffic at Canadian airports has experienced moderate growth over all, except during the 1982 recession and in 1986. From 1980 to 1988, total E&D cargo traffic at the "Top 30" airports grew at average rate of 3.3% a year. More recently (1986 to 1988) air cargo increased at 7.7% a year, and for 1989 the growth was about 16.2%. Figure 5–1 sets out the pattern of growth from 1980 to 1989.

Two factors may help to explain the recent strong performance in the cargo market. First, many firms have realized the advantages of keeping lower inventories and having goods shipped, as needed, by air from suppliers. In times of high interest rates, inventory costs grow, and air transportation helps to reduce this expense. Second, the increased need for Canadian business to function in an international market has made air freight a necessary form of transportation for perishable and high-value goods.

Figure 5–2 shows cargo growth rates at the "Top 30" airports from 1985 to 1989.

Growth rates for cargo tonnage have not been uniform across the regions of Canada. The biggest increase in total E&D cargo in 1989 occurred in the Central region. However, the spectacular one year increase was from a small base figure and is not likely to be repeated. The Western region recorded the second-highest rate of growth (a 21% increase in traffic over the 1988 level), closely followed by the Pacific Region, reflecting gains in Pacific Rim trade.

The Atlantic region, after a small increase in cargo traffic in 1988 (3.1%), enjoyed a large increase (17.7%) in 1989. However, this substantial growth is partly the result of calculating from a smaller base.

Figure 5–3 indicates regional growth rates for E&D cargo at all airports in 1989.

5.2 NATIONAL CARGO FORECASTS

The forecast for E&D cargo tonnage as shown in Table 5–1 is one of continued growth at approximately 3.5%, or higher than the rate of increase expected for the Canadian economy over the medium term (1988–1998). This projected rate of growth is based upon several factors, including an expectation of reduced freight rates in the industry as a consequence of excess cargo capacity in the holds of scheduled air carriers, especially as new wide-bodied aircraft are put into service. Sustained strong development is expected in international trade, especially with Pacific Rim countries. The Canada-U.S. Free Trade Agreement could also have a significant influence on the air cargo market.

Figure 5–4 shows the historical and forecasted levels of total E&D cargo at Canada's "Top 30" airports.

5.3 REGIONAL CARGO FORECASTS

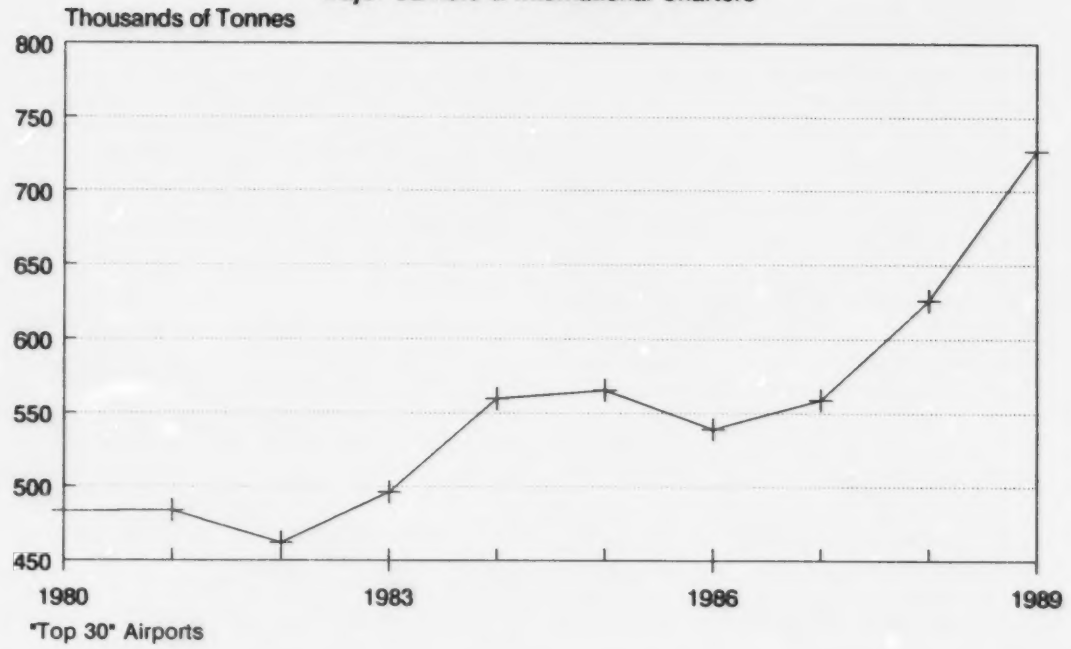
The Atlantic, Ontario and Pacific regions are expected to see above-average annual growth in E&D cargo traffic during the 1989–1998 period. Ontario, with the largest cargo tonnage will continue to make gains, led by cargo activity at Pearson International Airport. Continued growth of about 4.0% is expected for the Pacific region, buoyed by the strength of its international traffic.

Figure 5–5 and Table 5–1 show the regional forecasts for E&D cargo tonnage.

5.4 SITE CARGO FORECASTS

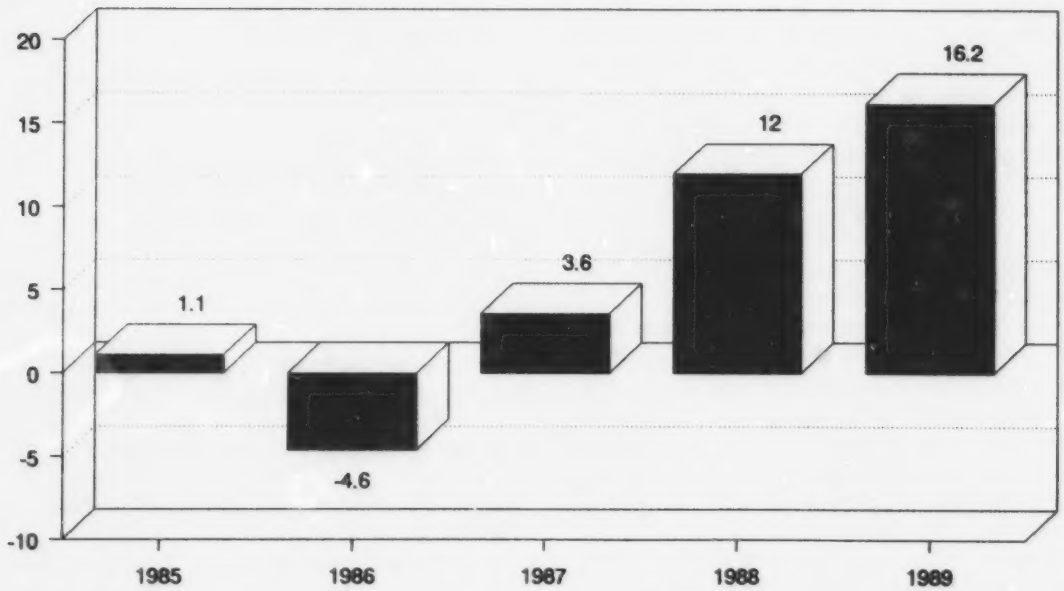
Table 5–2 presents the E&D cargo forecasts for the "Top 30" airports in total, with details for the four most important sites (Pearson, Vancouver, Mirabel and Dorval), which account for more than 78% of total cargo tonnage in Canada.

Figure 5–1
E&D Cargo—Historical
Major Carriers & International Charters



"Top 30" Airports

Figure 5–2
E&D Cargo Major Carriers & International Charters
Historical—Annual % Change



"Top 30" Airports

Figure 5–3
E&D Cargo Major Carriers & International Charters
By Region—% Growth
1988–1989

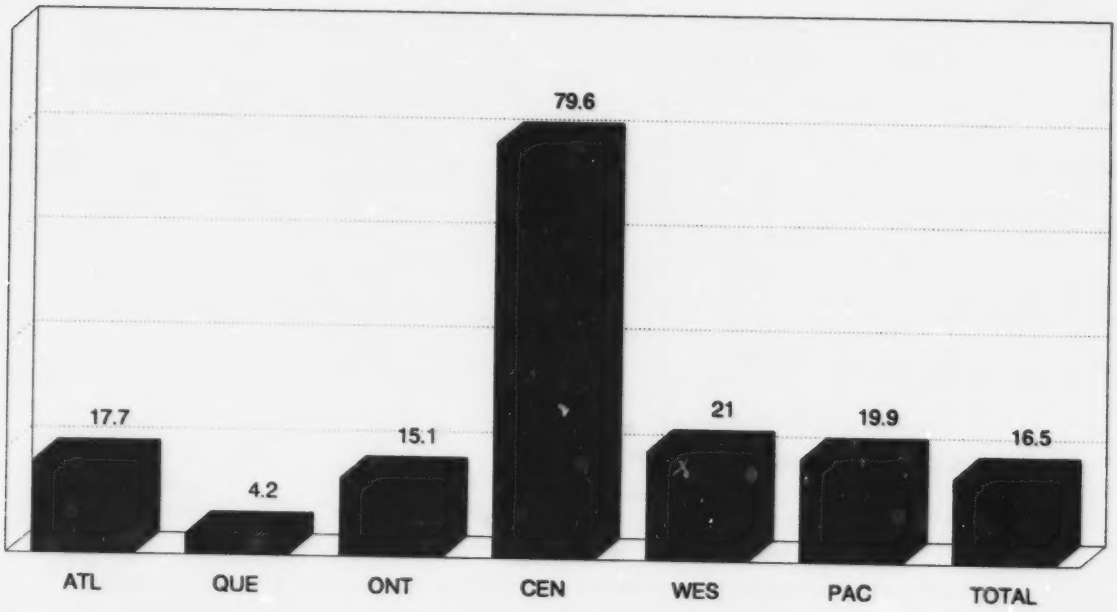


Figure 5–4
E&D Cargo Major Carriers & International Charters
"Top 30" Airports
1980–2003

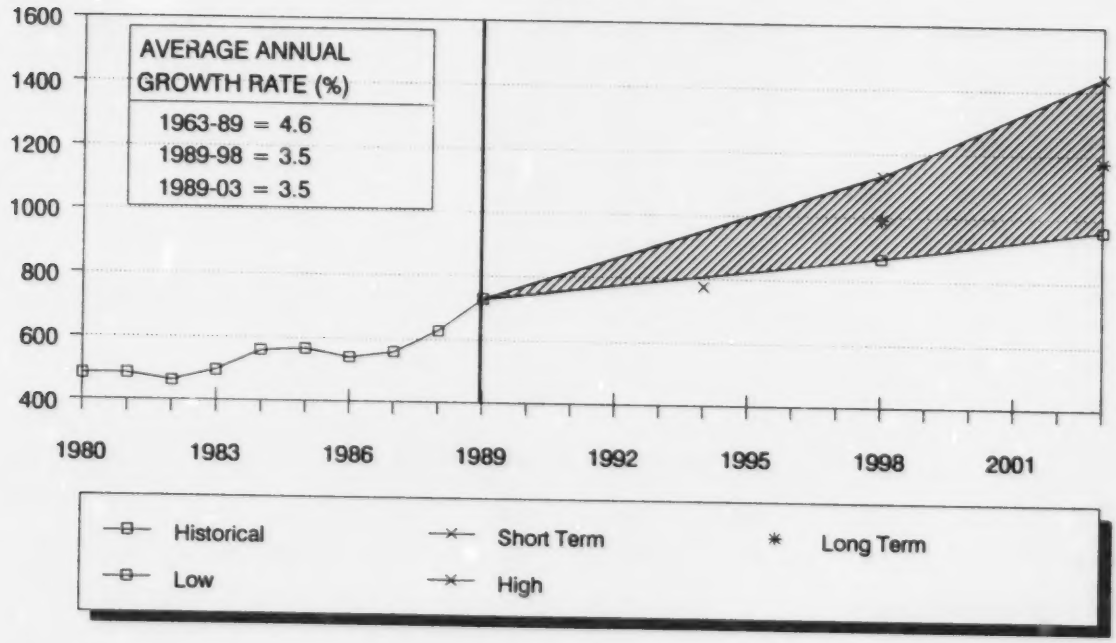


Figure 5–5
E&D Cargo Major Carriers & International Charters
By Region
1980–2003

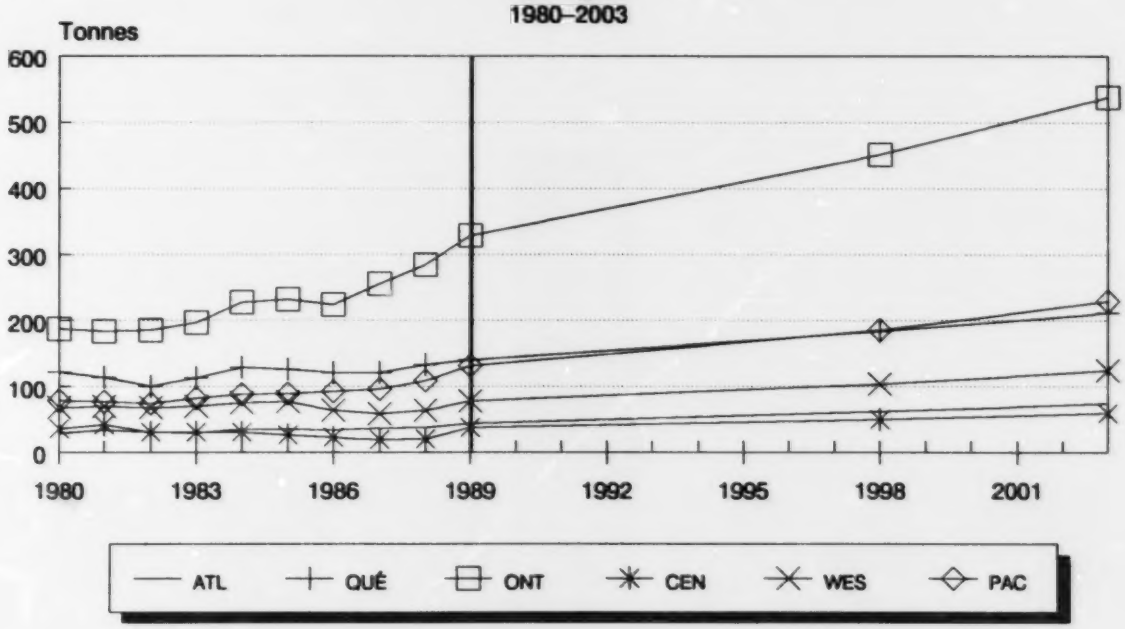


Table 5–1
Enplaned and Deplaned Air Cargo
Major Carriers and International Charter
('000 Metric Tonnes)

YEAR	ATLANTIC	QUEBEC	ONTARIO	CENTRAL	WESTERN	PACIFIC	TOTAL*	TOP 30 AIRPORTS
1980	29.37	121.83	186.92	36.08	67.72	77.81	519.73	483.3
1981	33.37	113.82	183.44	41.89	69.52	76.83	518.87	483.7
1982	29.91	99.60	185.51	31.07	68.54	73.79	488.42	461.9
1983	29.53	113.18	196.51	29.82	70.28	81.79	521.10	496.0
1984	34.62	129.21	227.79	30.32	75.36	87.71	585.01	559.2
1985	34.70	126.71	232.00	26.07	77.22	89.35	586.04	565.1
1986	34.51	121.44	224.21	22.54	64.06	92.75	559.51	539.1
1987	36.37	120.35	254.92	18.60	58.89	95.82	584.95	558.6
1988	37.48	133.82	284.36	20.51	63.52	108.89	648.58	625.8
1989	44.11	139.51	327.65	36.88	77.63	130.91	756.69	727.2
1998	62	183	451	50	104	186	1,036	991
2003	74	212	538	59	124	229	1,236	1,177
				AVERAGE ANNUAL GROWTH RATE, %				
1989–98	3.9	3.1	3.6	3.4	3.3	4.0	3.6	3.5
1989–03	3.8	3.0	3.6	3.4	3.4	4.1	3.6	3.5

* Total for all airports in Canada.

Table 5–2
Total Enplaned and Deplaned Cargo
(Tonnes)

AIRPORT*	1989 TOTAL E&D	1989 PERCENT OF TOTAL	1989 CUMULATIVE PERCENT	1998 TOTAL E&D	2003 TOTAL E&D
1 Lester B. Pearson	312,458	43.0%	43.0%	431,000	518,000
2 Vancouver Int'l	124,325	17.1%	60.1%	178,000	224,000
3 Mirabel Int'l	93,828	12.9%	73.0%	124,000	141,000
4 Dorval Int'l	39,261	5.4%	78.4%	50,000	59,000
5 Calgary Int'l	39,230	5.4%	83.8%		
6 Winnipeg Int'l	29,677	4.1%	87.8%		
7 Edmonton Int'l	29,301	4.0%	91.9%		
8 Halifax Int'l	27,151	3.7%	95.6%		
9 Ottawa Int'l	8,217	1.1%	96.7%		
10 St. John's	5,947	0.8%	97.5%		
11 Moncton	4,572	0.6%	98.2%		
12 Regina	2,566	0.4%	98.5%		
13 Saskatoon	1,778	0.2%	98.8%		
14 Edmonton Munic.	1,124	0.2%	98.9%		
15 Charlottetown	1,114	0.2%	99.1%		
16 Thunder Bay	1,079	0.1%	99.2%		
17 Québec	948	0.1%	99.4%		
18 Saint John	901	0.1%	99.5%		
19 Gander Int'l	866	0.1%	99.6%		
20 Kelowna	550	0.1%	99.7%		
21 Fort St. John	536	0.1%	99.8%		
22 Fredericton	510	0.1%	99.8%		
23 Prince George	432	0.1%	99.9%		
24 Victoria	288	0.0%	99.9%		
25 Windsor	197	0.0%	100.0%		
26 Sudbury	126	0.0%	100.0%		
27 Sydney	87	0.0%	100.0%		
28 Kamloops	64	0.0%	100.0%		
29 Sept-Iles	55	0.0%	100.0%		
30 Sault Ste. Marie	24	0.0%	100.0%		
TOTAL 30 AIRPORTS	727,212			991,000	1,177,000

*Forecasts for airports with less than 100,000 tonnes annually are not considered reliable.

6. ITINERANT AIRCRAFT MOVEMENT FORECASTS

An itinerant aircraft movement is an arriving or departing flight, either entering or leaving the circuit traffic control of an airport regardless of the type of service in which the aircraft in question is employed (i.e., Air carrier, Other Commercial, Private or Government). Itinerant aircraft movements (see definition, Appendix D) are an indicator of airport usage, regardless of type of operation or commodity carried, and as such are of particular value in determining the need for navigation facilities and services.

The "Top 77" airports discussed in the preceding chapter were selected primarily for their significance in terms of passenger volumes. For the sake of consistency, the present chapter discusses those same airports in relation to aircraft activity. The "Top 77" consisting largely of tower airports, account for about 74% of the total itinerant aircraft movements reported at all Canadian airports (tower, non-tower, and flight service stations).

6.1 CURRENT ENVIRONMENT

Of total itinerant aircraft movements at the "Top 77" airports in 1989, general aviation (GA) accounted for 57% and air carriers for 43%. It should be pointed out that in 1980 GA accounted for 74% of the total itinerant movements. The historical distribution is illustrated in Figure 6–1.

Historical traffic growth can be divided into three periods:

- 1963 to 1980—The growth of air-carrier aircraft movements during this period was curbed by the introduction, in the early 1970s, of wide-body aircraft. The use of an index (1963 = 100) allows for a comparison in growth between E&D passengers and air carrier movements during this period. As Figure 6–2 shows, growth in air carrier movements almost reached a plateau during the second half of the 1970s, and over the whole period E&D passengers increased almost twice as fast as air carrier movements.

  During this period, general-aviation traffic was stimulated by strong economic growth. Activity increased in all GA categories, namely other commercial, private and government. Exploration and development in the resource sectors in the Western and Atlantic provinces (energy mega-projects) contributed significantly to the growth.
- 1980 to 1983—Air carrier movements during this period exhibit a trend very similar to that of the passenger demand. See Figure 6–3.

  For general aviation, the recessionary period of 1981–1983 had a devastating effect, particularly on the private category, where activity was curtailed by a combination of the recession and higher operating costs.
- 1983 to 1989—The growth of air carrier movements during this period was affected by the restructuring of domestic routes under economic regulatory reform. Major carriers abandoned most short-haul, low-density services in favour of their regional affiliates. One result was the introduction of turboprop aircraft with 30 to 50 seats, reversing the trend of larger aircraft size in the 1970s. The use of an index (1980 = 100) allows for a comparison in growth between E&D passengers and air carrier movements during this period. As Figure 6–3 shows, growth in air carrier movements increased faster than the passenger demand.

  Despite the strong uninterrupted economic growth observed during this period, general aviation failed to recover any of the ground it lost during the recession. Most recently, the professionally operated sectors (corporate and other commercial) have seen some recovery, but private GA has remained flat at best.

Figure 6–1
Itinerant Aircraft Movements—Historical
"Top 77" Airports

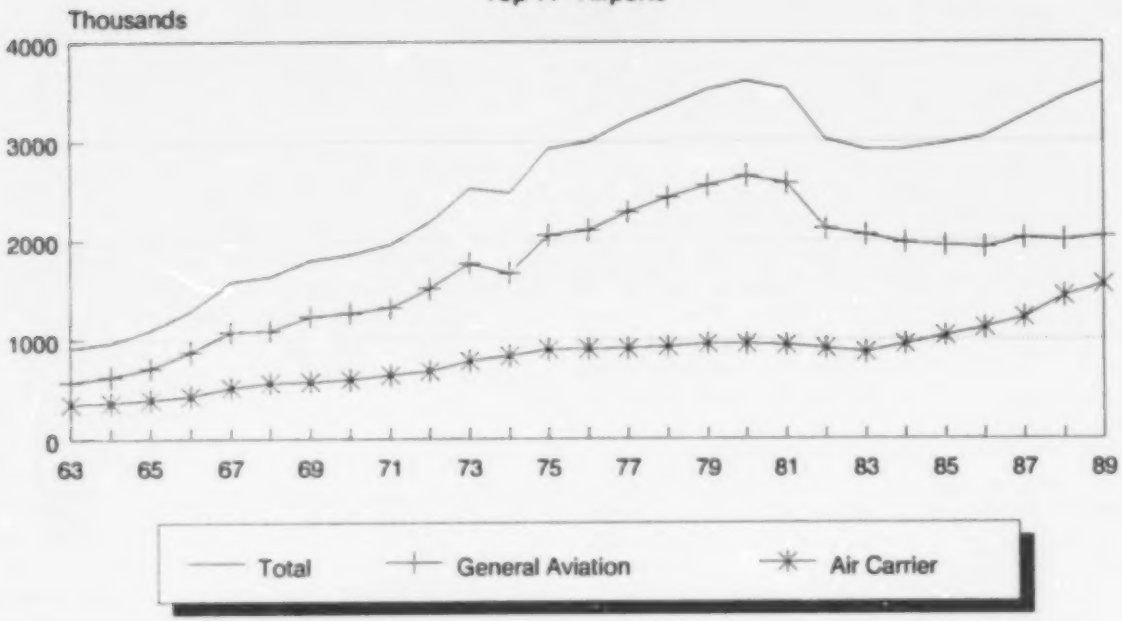


Figure 6–2
Air-Carrier Movements vs. E&D Passengers
Growth Index (1963 = 100)
1963–1979

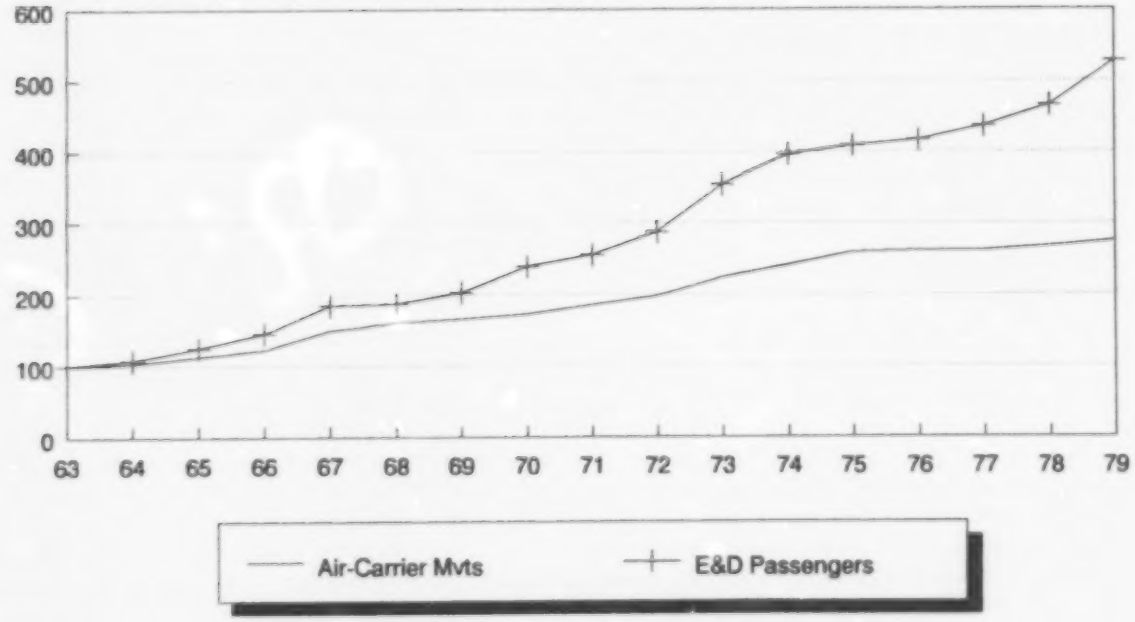
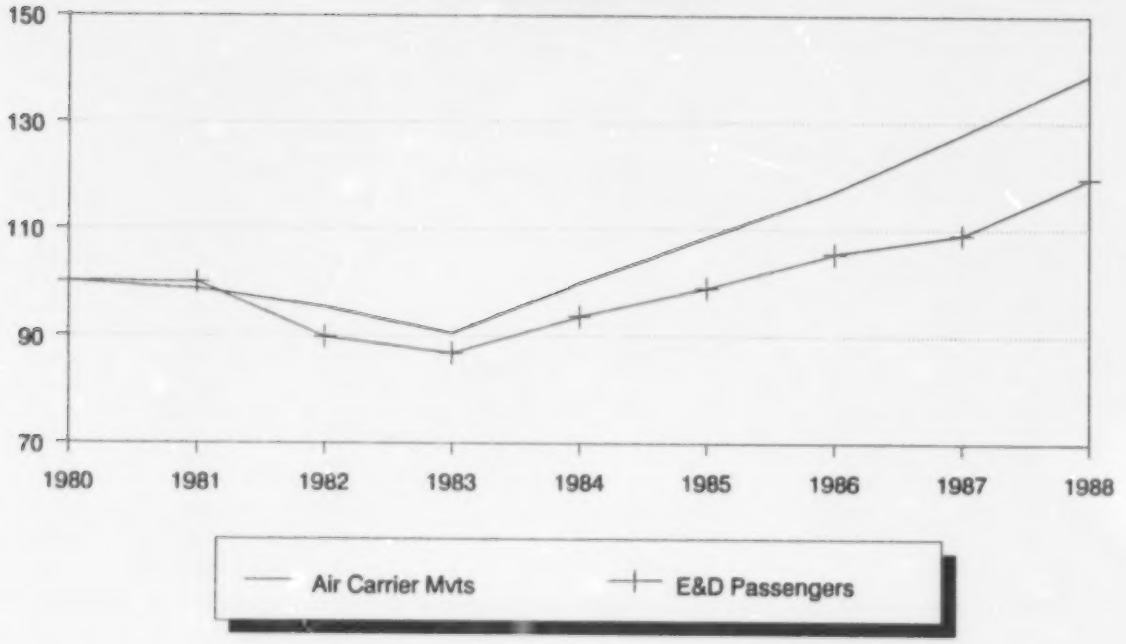


Figure 6–3
1980–88 Air Carrier Movements vs. E&D Pax
Growth Index (1980 = 100)



Historical data for itinerant movements are presented in Table 6–1.

For the major carriers, domestic aircraft movements constitute the largest traffic component, with almost 77% of total air carrier aircraft movements at the "Top 77" airports in 1989.

Air carrier movements to and from the U.S. (Transborder) and countries other than the U.S. (Other International) constitute the remaining 23% of the major carrier traffic in Canada, with approximately 19% and 4%, respectively, of major air carrier aircraft movements in 1989.

In 1989, 22% of all itinerant aircraft movements took place in the Ontario region. Of the remaining traffic, approximately 53% was distributed west of Ontario (Central, Western and Pacific regions) and approximately 25% east of Ontario (Quebec and Atlantic).

6.2 NATIONAL AIRCRAFT MOVEMENT FORECASTS

Figures 6–4, 6–5 and 6–6 and Tables 6–2, 6–3 and 6–4 present the expected nation-wide growth pattern for itinerant movements by air carriers, by general aviation and in total over the forecast period.

The updated forecasts presented in this chapter reflect the set of specific assumptions presented in the earlier sections of this report.

6.2.1 Total Itinerant

The outlook for total itinerant aircraft movements is one of relatively slow growth (about 2% per annum—see Figure 6–4), well below that observed at any time during the historical period. To understand the principal factors behind this very low growth, it is necessary to examine the separate outlooks for general aviation and air carriers.

6.2.2 Air Carriers

Throughout the sixties and seventies, air carrier movements grew at a rate considerably below that of passenger demand. This trend reflected the productivity gains of larger carriers. However, with the introduction of economic regulatory reform and resulting extensive route rationalizations on the part of the major carriers, average aircraft size began to decrease. Since 1980, air carrier movements have grown at a faster rate than that of passenger demand.

There is strong evidence that the rapid expansion of regional and local carriers in recent years

Table 6–1
Itinerant Aircraft Movements
Scheduled Services—Major and Regional/Local Carriers
Charter and General Aviation
Top 77 Airports*
('000)

YEAR	AIR CARRIER						GENERAL (5) AVIATION	TOTAL (6) ITINERANT
	MAJOR CARRIERS (1)			REG/LOC (2) CARRIERS	CHARTER (3) ALL	TOTAL (4)		
	DOM	TB	OI					
1977	569	110	23		16	904	2,294	3,198
1978	574	110	23		18	923	2,436	3,359
1979	614	111	22		20	954	2,564	3,518
1980	634	114	20	172	21	955	2,652	3,607
1981	627	111	19	180	23	944	2,585	3,529
1982	585	105	19	207	28	909	2,121	3,030
1983	552	106	18	202	29	863	2,057	2,920
1984	579	110	19	243	28	952	1,976	2,928
1985	602	115	21	326	32	1,034	1,946	2,980
1986	585	120	24	418	31	1,118	1,932	3,050
1987	567	117	26	526	32	1,221	2,026	3,247
1988	551	125	29	748	43	1,432	2,008	3,440
**1989	506	124	31	893	42	1,552	2,043	3,595
1998	562	189	48	1,170	53	1,968	2,415	4,383
2003	658	223	60	1,281	63	2,230	2,612	4,842
	AVERAGE ANNUAL GROWTH RATE, %							
1989–1998	1.2	4.8	5.0	3.0	2.6	2.7	1.9	2.2
1989–2003	1.9	4.3	4.8	2.6	2.9	2.6	1.8	2.1

* The forecasts were obtained by adding site specific forecasts. (Bottom Up Approach)
** Preliminary except data from Aircraft Movement Statistics
1 Source: Statement 6
2 Source: Statement 4
3 Source: Statement 2—Table 22F
4,5,6 Source: Aircraft Movement Statistics

(Figure 6–7) is largely completed. It is anticipated that average aircraft size will resume its progression and that, once again, air carrier movements will grow at a rate below that of passenger demand.

Growth in total air carrier movements at Canada's "Top 77" airports is expected to average 2.7% annually between 1989 and 1998 and 2.6% between 1989 and 2003. The forecast is illustrated in Figure 6–6 an Table 6–2.

Air carrier growth by traffic sector is expected to follow a pattern similar to that forecast for passenger growth. Growth in the domestic sector is expected to fall behind that of the international sector, as the rapid expansion of regional and local carriers ends and the use of larger aircraft prevails once again.

6.2.3 General Aviation

Private recreational flying activity, which was the dominant component of general aviation in the 1970s, accounted for only about 26% in 1989. Besides the recreational element, private GA activity includes both corporate aircraft, operated by professional flight crews under regulations similar to those for air carriers, and personal aircraft operated for business purposes.

Figure 6–4
Itinerant Aircraft Movements
"Top 77" Airports
1963–2003

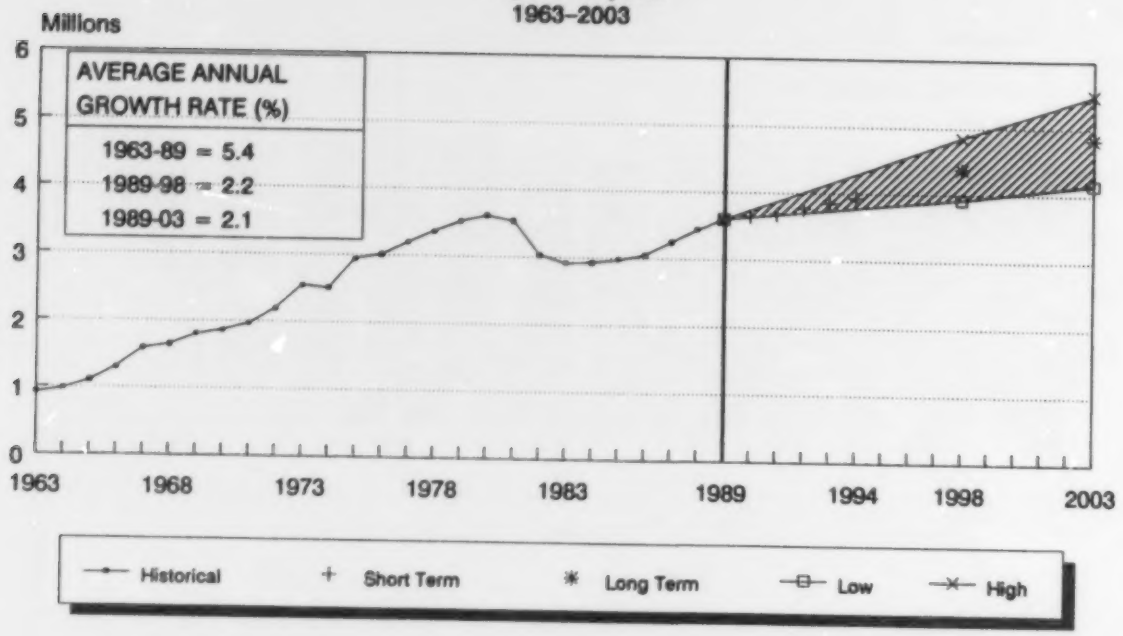


Figure 6–5
General-Aviation Movements
"Top 77" Airports
1963–2003

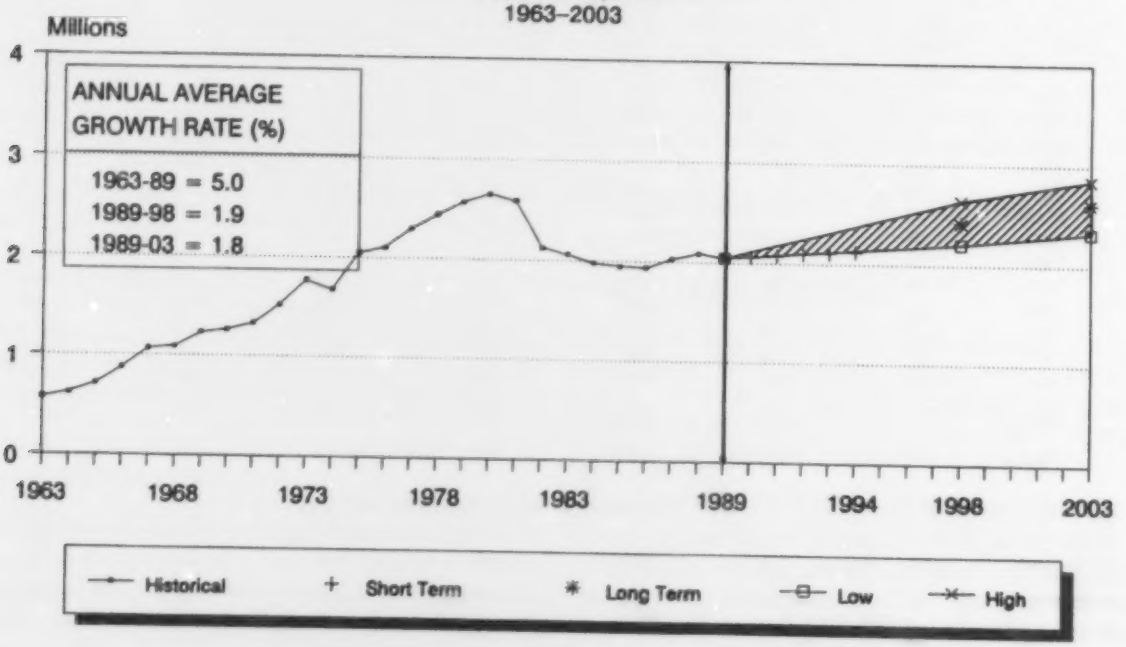


Figure 6–6
Air-Carrier Movements
"Top 77" Airports
1963–2003

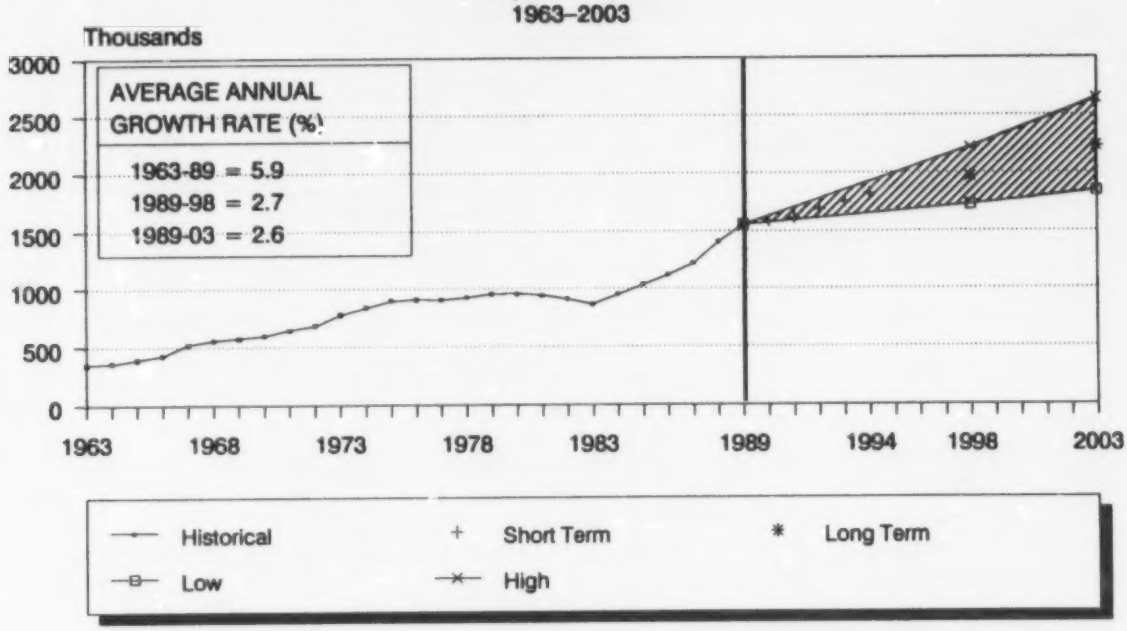
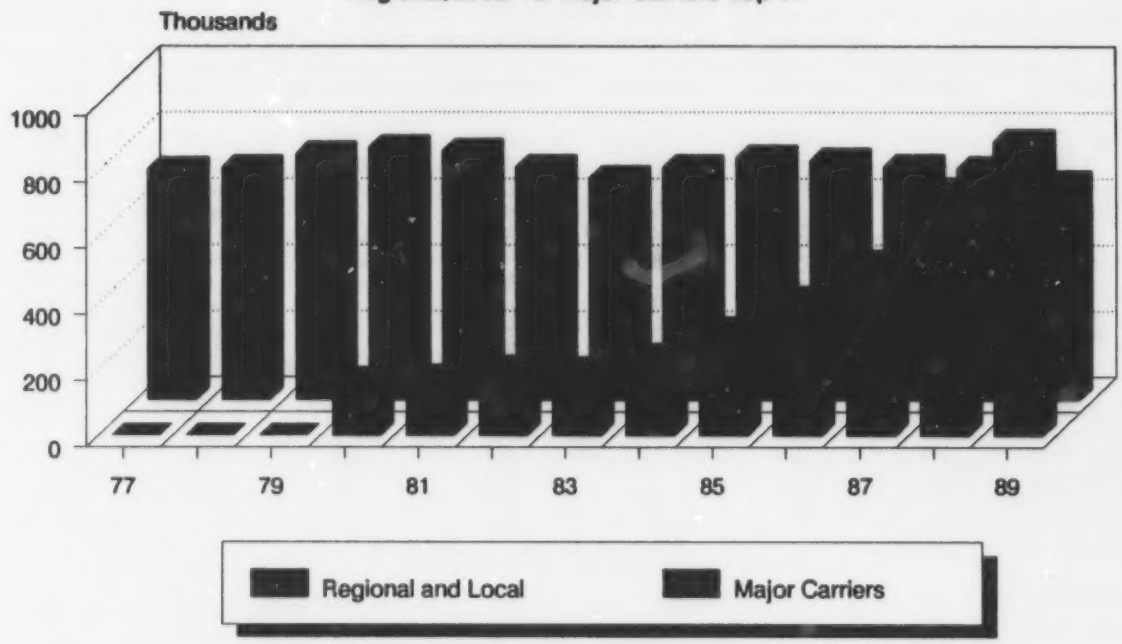


Table 6–2
Itinerant Aircraft Movements: Air Carrier
('000)

YEAR	NATIONAL BY REGION—TOP 77 AIRPORTS						
	ATLANTIC	QUEBEC	ONTARIO	CENTRAL	WESTERN	PACIFIC	TOTAL
1977	91	179	244	97	144	149	904
1978	92	182	249	98	148	154	923
1979	82	183	263	105	166	155	954
1980	85	167	265	107	175	156	955
1981	88	155	265	101	162	153	944
1982	86	145	257	91	173	157	909
1983	69	142	258	90	160	144	863
1984	84	155	281	101	173	158	952
1985	88	159	316	108	183	180	1,034
1986	97	175	342	114	178	212	1,118
1987	131	188	377	119	180	226	1,221
1988	157	228	445	137	208	258	1,433
1989	190	256	475	132	235	264	1,552
1998	218	322	608	201	263	357	1,969
2003	242	364	689	220	319	397	2,231
	AVERAGE ANNUAL GROWTH RATE, %						
1989–1998	1.5	2.6	2.8	4.8	1.3	3.4	2.7
1989–2003	1.7	2.5	2.7	3.7	2.2	3.0	2.6

Figure 6–7
Historical Air Carrier Aircraft Movements
Regional/Local vs. Major Carriers Top 77



While no resurgence is expected in recreational activity, the corporate element of private activity has shown recovery and can be expected to grow with the favourable economic environment. Total private activity is expected to grow at a slower rate than total GA and to account for only 27% of itinerant movements by 2003.

The strongest growth will be in the other commercial component, but the rate will be lower than in the past, given that Hibernia is the only resource mega-project anticipated in the forecast horizon. Finally, growth in government civil and military GA activity will continue to be slightly below the growth for GA over all.

Growth in total GA movements at Canada's "Top 77" airports is expected to average 1.9% annually between 1989 and 1998 and 1.8% between 1989 and 2003. The forecast is illustrated in Figure 6–5 and Table 6–3.

6.3 REGIONAL AIRCRAFT MOVEMENT FORECASTS

Across Canada the forecast growth in total itinerant aircraft movements is also expected to show a pattern similar to that for regional passenger traffic growth. Increases in aircraft movements should be above average in the Atlantic, Ontario, Central and Pacific regions as a result of above-national-average economic growth.

Finally, the Quebec and Western regions are expected to trail behind, with average annual growth of 1.9% and 1.2%, respectively from 1989 to 2003.

The regional forecasts for air carrier movements are presented in Table 6–2, for GA movements in Table 6–3 and for total itinerant movements in Table 6–4.

6.4 SITE AIRCRAFT MOVEMENT FORECASTS

6.4.1 Major Airports

Figures 6–8 through 6–15 present historical data and the forecasts of itinerant aircraft movements for each of the "Top Nine" Canadian airports. The graphs depict air carrier movements and general-aviation activity separately and as a combined total.

Toronto: L.B. Pearson International Airport

Pearson International Airport is expected to experience strong growth in itinerant air-carrier movements, given the size of the Toronto area market and the role of the airport as a national hub.

Table 6–3
Itinerant Aircraft Movements: General Aviation
('000)

YEAR	NATIONAL BY REGION—TOP 77 AIRPORTS						
	ATLANTIC	QUEBEC	ONTARIO	CENTRAL	WESTERN	PACIFIC	TOTAL
1977	178	308	351	275	533	629	2,294
1978	199	351	375	277	586	648	2,436
1979	201	346	393	277	656	691	2,564
1980	210	354	392	287	732	677	2,652
1981	205	337	357	296	711	679	2,585
1982	183	299	320	252	547	520	2,121
1983	187	287	305	236	522	520	2,057
1984	184	273	309	228	494	488	1,976
1985	189	254	311	231	482	479	1,946
1986	198	240	308	217	456	513	1,932
1987	202	260	325	228	445	565	2,025
1988	164	266	338	229	431	580	2,008
1989	168	291	322	236	431	595	2,045
1998	238	329	388	277	479	706	2,417
2003	265	354	416	295	506	777	2,613
	AVERAGE ANNUAL GROWTH RATE, %						
1989–1998	3.9	1.4	2.1	1.8	1.2	1.9	1.9
1989–2003	3.3	1.4	1.8	1.6	1.2	1.9	1.8

Figure 6–8
L.B. Pearson International Airport
Itinerant Aircraft Movements
1977–2003

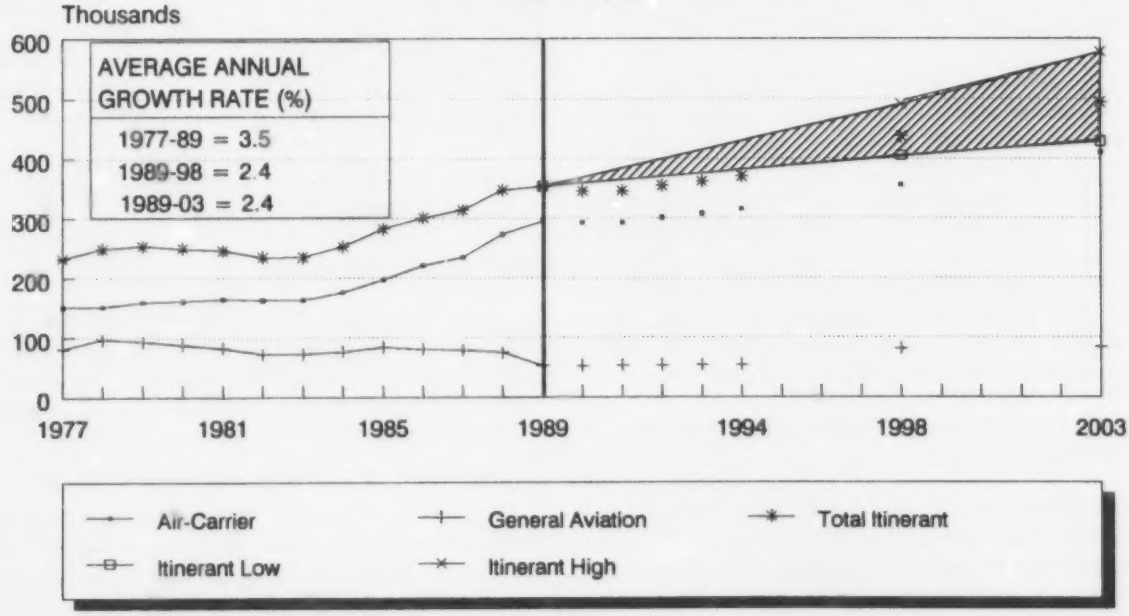


Table 6–4
Total Itinerant Aircraft Movements
('000)

YEAR	NATIONAL BY REGION—TOP 77 AIRPORTS						
	ATLANTIC	QUEBEC	ONTARIO	CENTRAL	WESTERN	PACIFIC	TOTAL
1977	269	486	595	373	697	778	3,198
1978	291	534	624	375	734	803	3,361
1979	283	529	656	382	822	847	3,519
1980	295	521	657	393	907	833	3,606
1981	293	492	622	396	893	832	3,528
1982	269	444	577	343	720	677	3,030
1983	256	429	563	326	681	664	2,920
1984	268	428	589	330	667	646	2,928
1985	277	413	628	338	665	659	2,980
1986	295	416	649	332	633	725	3,050
1987	333	449	702	347	625	791	3,247
1988	321	494	783	367	639	837	3,441
1989	358	548	798	368	666	855	3,597
1998	455	651	995	477	742	1,063	4,383
2003	507	718	1,105	514	824	1,173	4,841
	AVERAGE ANNUAL GROWTH RATE, %						
1989–1998	2.7	1.9	2.5	2.9	1.2	2.4	2.2
1989–2003	2.5	1.9	2.4	2.4	1.5	2.3	2.1

The average annual growth rate of all itinerant movements at Pearson International is forecast to be 2.4% for the period 1989–2003. (Figure 6–8).

Vancouver International Airport

Vancouver International has already experienced strong growth in air carrier movements because of rapid expansion by regional/local carriers using turboprop and piston-engine aircraft. This trend is expected to be reversed as the proportion of movements flown by larger jet aircraft increases, reflecting the role of the airport as a major hub for U.S. and Pacific-region traffic.

General-aviation movements at Vancouver International are expected to grow only moderately, as a result of some diversions to other airports.

The average annual growth rate for total itinerant aircraft movements at Vancouver International is forecast to be 2.2% for the period 1989–2003. (Figure 6–9).

Montréal: Dorval and Mirabel

The forecast for itinerant air-carrier movements at these airports assumes no change in their respective roles. Dorval will continue to serve domestic and transborder passenger traffic while Mirabel will be dedicated to air cargo and other international passenger traffic.

Dorval should see strong growth in itinerant air-carrier movements, especially by regional and local operations.

Air carrier movements at Mirabel are forecast to reflect strong growth in the other international passenger market.

The average annual growth rate for itinerant aircraft movements at the Montréal airports is forecast to be 2.1% for the period 1989–2003. (Figure 6–10)

Ottawa International Airport

Air carrier movements at Ottawa International Airport are expected to grow at a rate above the national trend due mainly to expanding traffic among regional and local carriers.

General-aviation itinerant movements at Ottawa are expected to increase at only 1% per annum.

The average annual growth of itinerant aircraft movements at Ottawa International is forecast to be 2.5% for the period 1989–2003. (Figure 6–11)

Figure 6–9
Vancouver International Airport
Itinerant Aircraft Movements
1977–2003

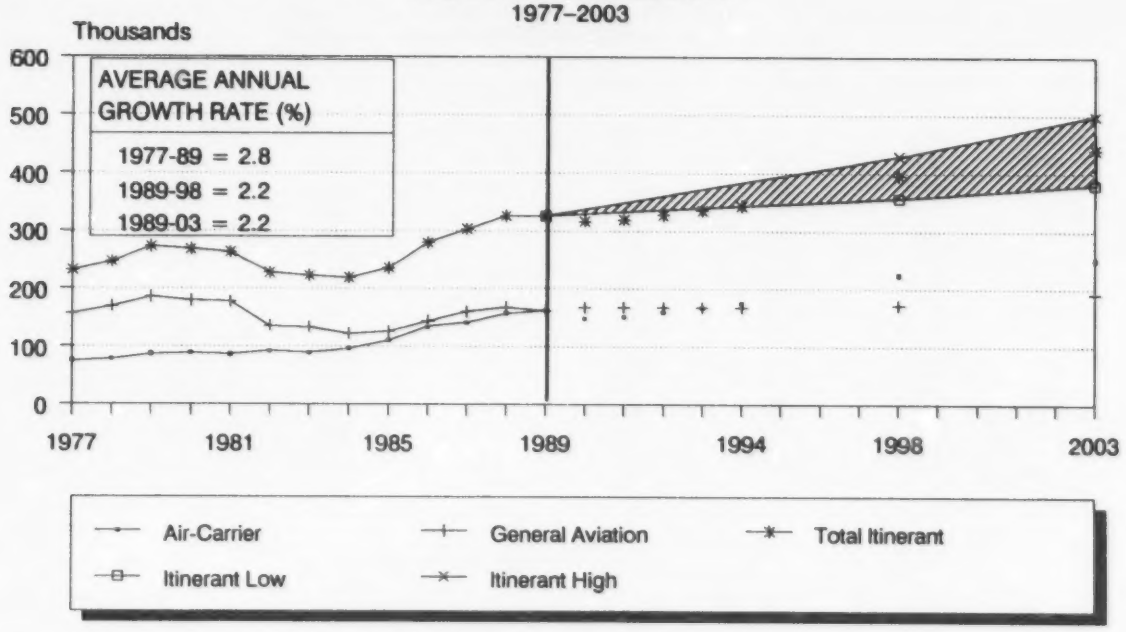
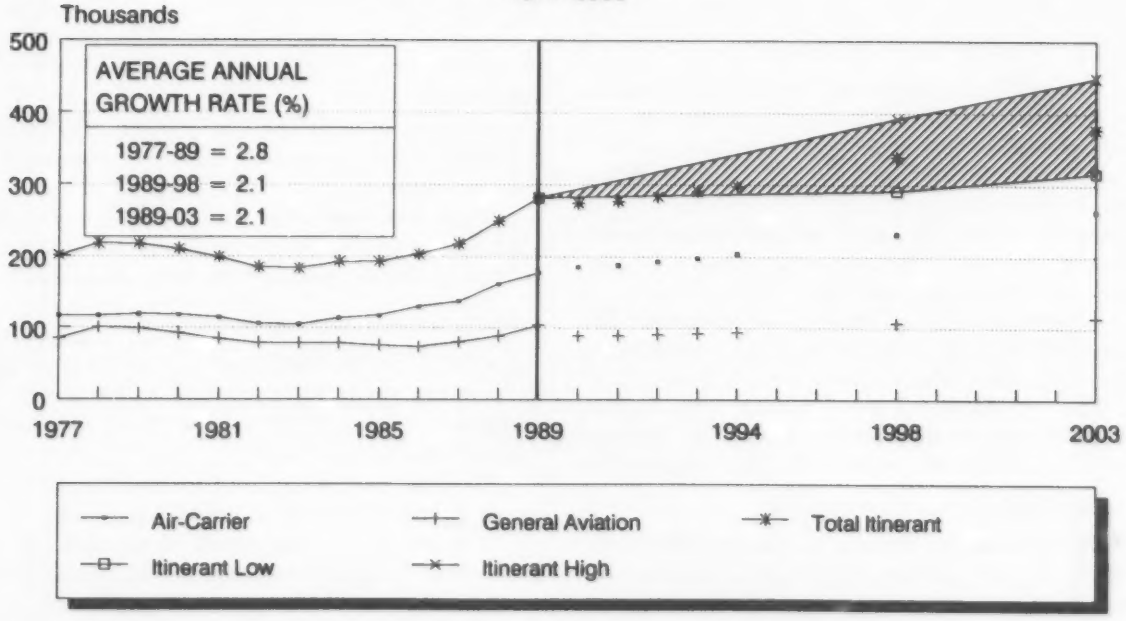


Figure 6–10
Montréal Airport System (Dorval/Mirabel)
Itinerant Aircraft Movements
1977–2003



Halifax International Airport

Halifax International Airport has experienced very strong growth in itinerant air-carrier movements for the last few years. Growth is expected to be more moderate as the shift from major carriers to turboprop services is completed and as regional and local carriers' expansion into new markets slows down.

For general aviation, the reopening of the flying school at Halifax favours growth, at least in the short term. For the longer term, growth rates comparable to the national trend are expected, even without stimulation from offshore resource exploration.

Average annual growth of itinerant aircraft movements at Halifax International Airport is forecast to be 1.6% for the period 1989–2003. (Figure 6–12)

Edmonton and Calgary International Airports

Itinerant air-carrier aircraft movements at Edmonton and Calgary International airports are forecast to grow at only moderate rates, due in part to the use of larger aircraft as both airports expand their international role.

The outlook for general-aviation activities at both Edmonton and Calgary International remains quite weak.

Average annual growth of itinerant aircraft movements at Edmonton and Calgary International airports is forecast to be 2.0% and 1.4% respectively for the period 1989–2003. (Figures 6–13 and 6–14)

Winnipeg International Airport

Serving as a regional hub for Manitoba and Northern Ontario, and located in a city with a balanced economy, Winnipeg International is forecast to experience moderate growth in air carrier movements due to expanded regional/local services.

General-aviation movements at Winnipeg are forecast to remain unchanged. During the forecast horizon, Winnipeg is not expected to recapture its peak general-aviation traffic volume, which occurred in 1981.

Average annual growth of itinerant movements at Winnipeg International is forecast to be 1.3% from 1989 to 2003. (Figure 6–15)

6.4.2 Other Airports

Tables 6–5, 6–6, and 6–7 present the forecasts of itinerant aircraft movements for air carriers, general aviation and combined traffic, respectively, at the "Top 77" Canadian airports for the years 1998 and 2003.

Figure 6–11
Ottawa International Airport
Itinerant Aircraft Movements
1977–2003

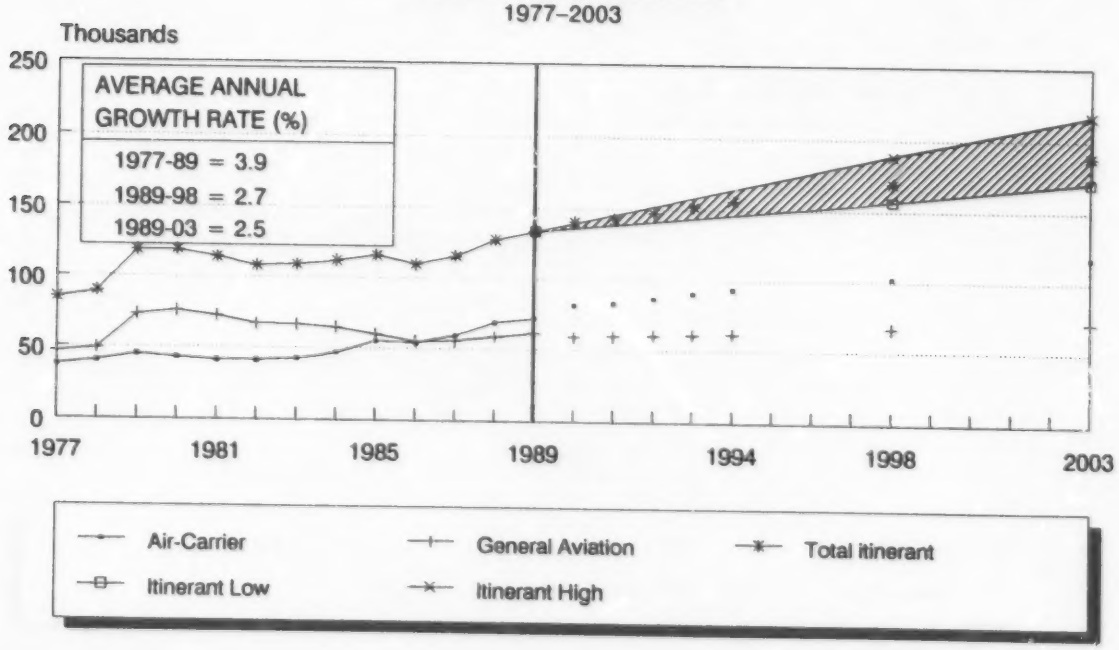


Figure 6–12
Halifax International Airport
Itinerant Aircraft Movements
1977–2003

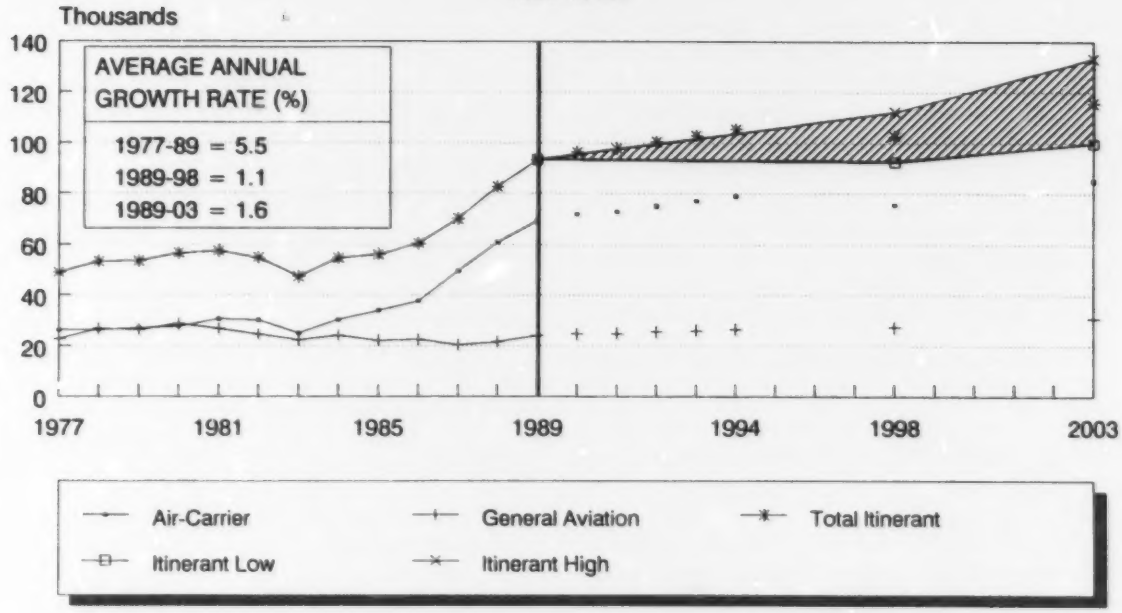


Figure 6–13
Edmonton International Airport
Itinerant Aircraft Movements

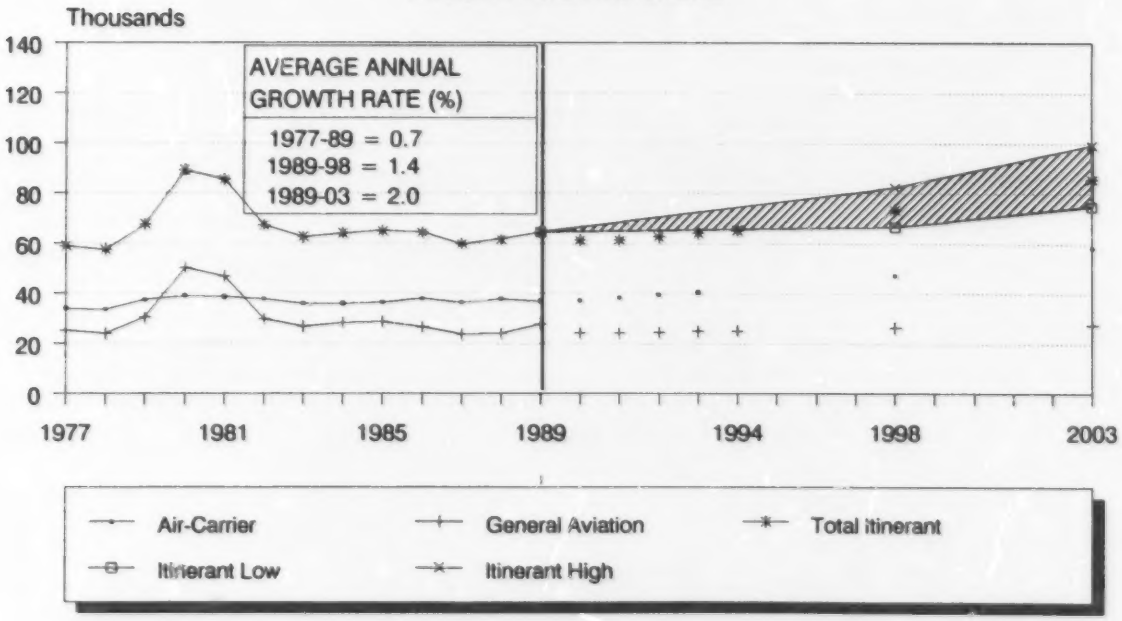


Figure 6–14
Calgary International Airport
Itinerant Aircraft Movements
1977–2003

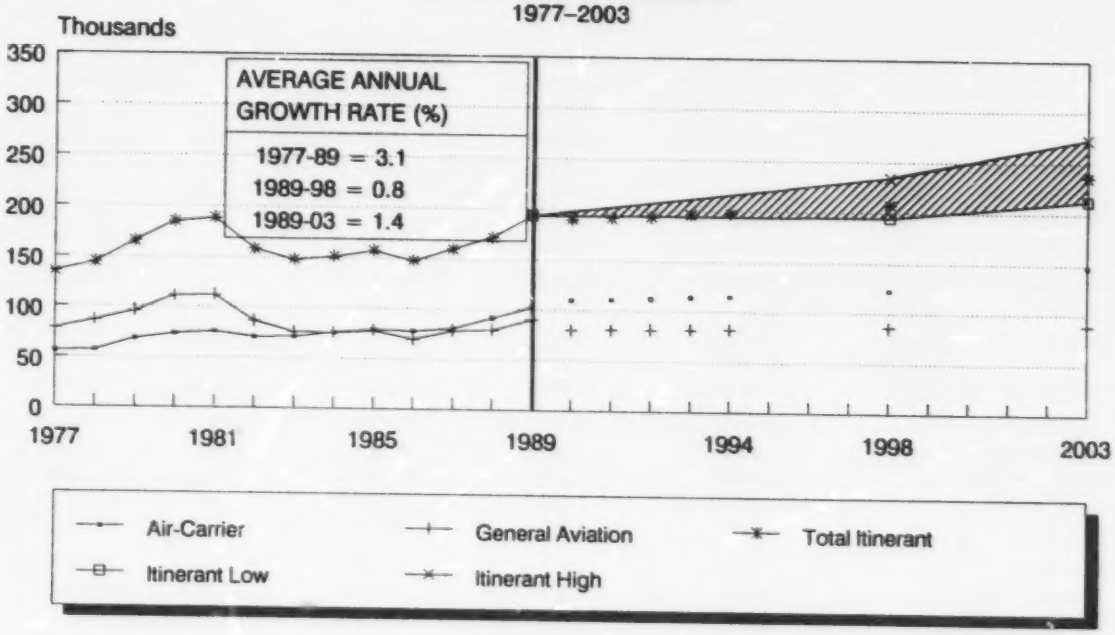


Figure 6–15
Winnipeg International Airport
Itinerant Aircraft Movements
1977–2003

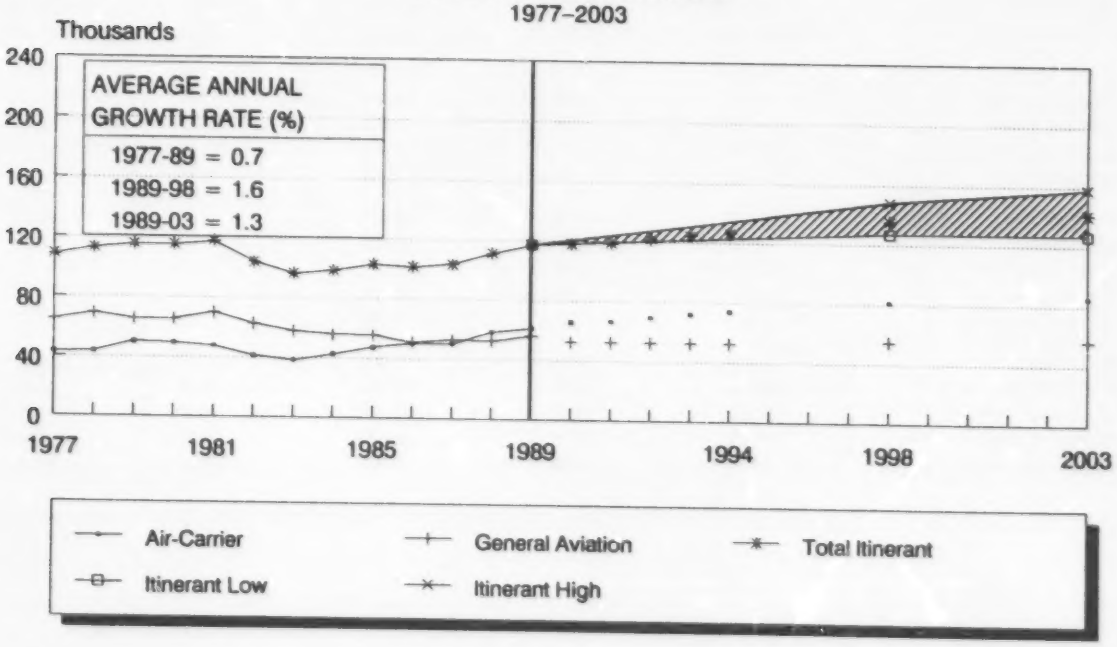


Table 6–5
Itinerant Aircraft Movements: Air Carrier

	AIRPORT	1989 TOTAL	1989 PERCENT OF TOTAL	1989 CUMULATIVE PERCENT	1998 TOTAL (THOUSANDS)	2003 TOTAL (THOUSANDS)
1	Lester B. Pearson	295,510	19.0%	19.0%	356.0	410.0
2	Vancouver Int'l	162,605	10.5%	29.5%	224.0	250.0
3	Dorval Int'l	146,026	9.4%	38.9%	190.0	213.0
4	Calgary Int'l	102,986	6.6%	45.6%	122.0	147.0
5	Ottawa Int'l	71,956	4.6%	50.2%	102.0	117.0
6	Halifax Int'l	69,193	4.5%	54.7%	85.1	95.8
7	Winnipeg Int'l	61,336	4.0%	58.6%	81.0	85.0
8	Edmonton Mun.	39,101	2.5%	61.1%	38.0	47.0
9	Québec	38,010	2.4%	63.6%	51.0	57.0
10	Edmonton Int'l	36,587	2.4%	65.9%	47.0	58.0
11	Mirabel Int'l	31,147	2.0%	67.9%	41.2	49.3
12	Victoria	29,753	1.9%	69.9%	40.6	46.6
13	Thunder Bay	22,915	1.5%	71.3%	34.0	35.0
14	St. John's	20,478	1.3%	72.7%	26.0	28.0
15	Regina	19,676	1.3%	73.9%	28.3	32.9
16	London	19,637	1.3%	75.2%	27.0	30.0
17	Saskatoon	19,575	1.3%	76.5%	28.0	33.0
18	Sudbury	18,879	1.2%	77.7%	27.3	28.0
19	Saint John	17,002	1.1%	78.8%	21.0	22.0
20	Moncton	16,683	1.1%	79.8%	16.0	17.0
21	Windsor	14,373	0.9%	80.8%	22.4	25.0
22	Sault Ste. Marie	14,093	0.9%	81.7%	19.7	21.5
23	Fredericton	13,830	0.9%	82.6%	15.7	16.9
24	Timmins	13,789	0.9%	83.5%	19.3	20.4
25	Kelowna	13,272	0.9%	84.3%	21.4	24.4
26	North Bay	13,168	0.8%	85.2%	16.0	18.0
27	Gander Int'l	12,455	0.8%	86.0%	16.3	17.3
28	Deer Lake	11,666	0.8%	86.7%	15.9	16.4
29	Yellowknife	10,705	0.7%	87.4%	11.8	14.9
30	Lethbridge	10,613	0.7%	88.1%	12.5	14.5
31	Sept Iles	10,553	0.7%	88.8%	9.8	10.7
32	Hamilton	9,768	0.6%	89.4%	11.9	14.3
33	Sydney	9,486	0.6%	90.0%	11.0	13.0
34	Val d'Or	9,352	0.6%	90.6%	9.6	10.2
35	Charlottetown	9,350	0.6%	91.2%	12.0	13.0
36	Penticton	8,936	0.6%	91.8%	9.0	10.0
37	Kamloops	8,711	0.6%	92.4%	9.8	10.8
38	Prince George	8,162	0.5%	92.9%	10.5	11.2
39	Baie Comeau	7,724	0.5%	93.4%	6.9	7.9
40	Grande Prairie	7,514	0.5%	93.9%	9.6	11.0

Table 6–5 (Cont'd)
Itinerant Aircraft Movements: Air Carriers

	AIRPORT	1989 TOTAL	1989 PERCENT OF TOTAL	1989 CUMULATIVE PERCENT	1998 TOTAL (THOUSANDS)	2003 TOTAL (THOUSANDS)
41	Cranbrook	6,700	0.4%	94.3%	9.1	9.3
42	Campbell River	6,637	0.4%	94.7%	13.0	13.0
43	Fort St. John	6,520	0.4%	95.1%	6.9	7.7
44	Rouyn/Noranda	6,374	0.4%	95.5%	10.5	11.6
45	Mont Joli	6,197	0.4%	95.9%	10.0	11.0
46	Thompson	5,772	0.4%	96.3%	13.2	13.7
47	Inuvik	5,350	0.3%	96.7%	7.5	9.7
48	Castlegar	5,253	0.3%	97.0%	5.7	6.0
49	Sarnia	4,535	0.3%	97.3%	5.1	5.8
50	Fort McMurray	4,513	0.3%	97.6%	3.6	4.0
51	Terrace	4,367	0.3%	97.9%	8.3	8.9
52	Stephenville	4,329	0.3%	98.1%	5.4	5.6
53	Wabush	3,938	0.3%	98.4%	6.0	7.0
54	Prince Rupert	3,276	0.2%	98.6%	1.2	1.3
55	Norman Wells	2,970	0.2%	98.8%	3.3	3.5
56	Churchill	2,516	0.2%	99.0%	6.0	7.0
57	Whitehorse	2,417	0.2%	99.1%	3.5	4.5
58	Port Hardy	2,356	0.2%	99.3%	3.8	4.4
59	Hay River	2,134	0.1%	99.4%	2.7	3.0
60	Fort Nelson	1,777	0.1%	99.5%	1.2	1.4
61	Sandspit	1,464	0.1%	99.6%	3.5	3.9
62	Fort Smith	1,330	0.1%	99.7%	1.7	1.9
63	Fort Simpson	1,128	0.1%	99.8%	1.1	1.1
64	Charlo	1,117	0.1%	99.8%	2.1	2.2
65	St. Hubert	976	0.1%	99.9%	5.3	6.3
66	Watson Lake	735	0.0%	100.0%	1.0	1.1
67	Abbotsford	599	0.0%	100.0%	0.4	0.4
68	Springbank	14	0.0%	100.0%	0.0	0.0
69	Pitt Meadows	5	0.0%	100.0%	0.0	0.0
70	Dryden**	0	0.0%	100.0%	6.8	9.0
71	Goose Bay	0	0.0%	100.0%	4.0	5.0
72	Langley	0	0.0%	100.0%	0.0	0.0
73	St. Andrews	0	0.0%	100.0%	0.0	0.0
74	Villeneuve	0	0.0%	100.0%	0.0	0.0
	TOTAL	1,551,878			2,008.5	2,272.3
	Toronto Island	11,667	0.8%		41.9	48.2

NOTE: Saguenay
** In 1989, no AMS statistics are available.

Table 6–6
Itinerant Aircraft Movements: General Aviation

AIRPORT	1989 TOTAL	1989 PERCENT OF TOTAL	1989 CUMULATIVE PERCENT	1998 TOTAL (THOUSANDS)	2003 TOTAL (THOUSANDS)
1 Vancouver Int'l	162,431	8.0%	8.0%	172.0	191.0
2 Victoria	97,621	4.8%	12.7%	141.1	152.5
3 Calgary Int'l	90,599	4.4%	17.2%	85.8	89.2
4 Edmonton Mun.	89,279	4.4%	21.5%	92.9	97.0
5 Dorval Int'l	85,278	4.2%	25.7%	87.4	93.6
6 St. Hubert	72,659	3.6%	29.3%	74.2	79.4
7 Abbotsford	61,412	3.0%	32.3%	76.3	83.9
8 Ottawa Int'l	61,335	3.0%	35.3%	66.9	71.5
9 Québec	60,384	3.0%	38.2%	65.0	70.6
10 Winnipeg Int'l	55,943	2.7%	41.0%	54.7	56.0
11 Lester B. Pearson	52,754	2.6%	43.6%	81.7	84.0
12 Pitt Meadows	51,310	2.5%	46.1%	61.0	68.4
13 London	45,387	2.2%	48.3%	47.8	51.2
14 Langley	43,597	2.1%	50.4%	46.9	51.1
15 Saskatoon	43,407	2.1%	52.5%	51.3	55.3
16 Hamilton	41,613	2.0%	54.6%	48.8	52.6
17 Regina	36,848	1.8%	56.4%	41.0	43.6
18 Springbank	36,471	1.8%	58.2%	50.8	53.3
19 St. Andrews	32,911	1.6%	59.8%	37.4	39.0
20 Moncton	32,878	1.6%	61.4%	36.9	38.8
21 Sudbury	32,707	1.6%	63.0%	38.0	44.8
22 Thunder Bay	32,542	1.6%	64.6%	48.2	52.2
23 Thompson	28,344	1.4%	66.0%	31.0	35.1
24 Edmonton Int'l	27,697	1.4%	67.3%	26.1	27.3
25 Windsor	26,191	1.3%	68.6%	31.6	33.8
26 St. John's	25,452	1.2%	69.9%	39.8	45.9
27 Campbell River	24,671	1.2%	71.1%	30.7	35.4
28 Halifax Int'l	24,104	1.2%	72.2%	27.3	30.9
29 Prince George	23,999	1.2%	73.4%	27.3	29.7
30 Whitehorse	23,589	1.2%	74.6%	27.6	29.1
31 Gander Int'l	23,048	1.1%	75.7%	29.1	33.0
32 Yellowknife	22,846	1.1%	76.8%	35.2	37.8
33 Sept Iles	21,960	1.1%	77.9%	34.7	37.9
34 Villeneuve	21,628	1.1%	79.0%	27.0	28.3
35 North Bay	21,456	1.1%	80.0%	28.2	29.9
36 Fort McMurray	21,113	1.0%	81.0%	26.2	27.5
37 Kelowna	20,148	1.0%	82.0%	23.3	24.9
38 Kamloops	18,411	0.9%	82.9%	24.3	26.5
39 Mirabel Int'l	18,326	0.9%	83.8%	19.4	20.8
40 Timmins	18,262	0.9%	84.7%	22.2	24.2

Table 6-6 (Cont'd)
Itinerant Aircraft Movements: General Aviation

	AIRPORT	1989 TOTAL	1989 PERCENT OF TOTAL	1989 CUMULATIVE PERCENT	1998 TOTAL (THOUSANDS)	2003 TOTAL (THOUSANDS)
41	Sault Ste. Marie	17,125	0.8%	85.6%	19.8	21.0
42	Port Hardy	16,539	0.8%	86.4%	22.7	24.0
43	Fort St. John	15,962	0.8%	87.1%	15.3	16.6
44	Grande Prairie	15,552	0.8%	87.9%	24.3	25.4
45	Penticton	15,509	0.8%	88.7%	17.5	18.4
46	Fredericton	14,839	0.7%	89.4%	16.9	17.6
47	Inuvik	13,931	0.7%	90.1%	15.4	17.3
48	Lethbridge	13,327	0.7%	90.7%	16.8	17.9
49	Norman Wells	12,927	0.6%	91.4%	16.2	19.0
50	Terrace	12,355	0.6%	92.0%	11.4	12.7
51	Charlottetown	11,817	0.6%	92.5%	15.3	16.4
52	Fort Nelson	11,776	0.6%	93.1%	11.9	12.9
53	Sandspit	11,407	0.6%	93.7%	14.9	16.8
54	Saint John	11,166	0.5%	94.2%	14.0	15.4
55	Val d'Or	10,562	0.5%	94.7%	19.8	21.0
56	Castlegar	9,502	0.5%	95.2%	12.2	12.9
57	Baie Comeau	8,911	0.4%	95.6%	10.0	10.7
58	Fort Smith	8,577	0.4%	96.1%	6.7	6.7
59	Deer Lake	8,233	0.4%	96.5%	10.8	12.6
60	Cranbrook	7,802	0.4%	96.8%	11.3	12.7
61	Mont Joli	7,075	0.3%	97.2%	7.4	8.0
62	Hay River	6,863	0.3%	97.5%	8.0	9.0
63	Watson Lake	6,530	0.3%	97.8%	9.0	9.3
64	Prince Rupert	6,208	0.3%	98.2%	13.1	15.6
65	Rouyn/Noranda	6,186	0.3%	98.5%	10.8	11.8
66	Sarnia	5,647	0.3%	98.7%	2.7	2.9
67	Sydney	5,483	0.3%	99.0%	6.1	7.0
68	Wabush	5,110	0.3%	99.2%	6.8	7.4
69	Churchill	5,040	0.2%	99.5%	5.1	5.3
70	Fort Simpson	4,455	0.2%	99.7%	5.2	5.8
71	Charlo	3,044	0.1%	99.9%	3.2	3.5
72	Stephenville	2,715	0.1%	100.0%	7.5	8.4
73	Goose Bay	104	0.0%	100.0%	40.7	45.4
74	Dryden**	0	0.0%	100.0%	7.8	8.8
	TOTAL	2,042,910			2,453.7	2,652.8
	Toronto Island	39,467	1.9%		85.0	91.6

NOTE: Saguenay
** In 1989, no AMS statistics are available.

Table 6–7
Total Itinerant Aircraft Movements

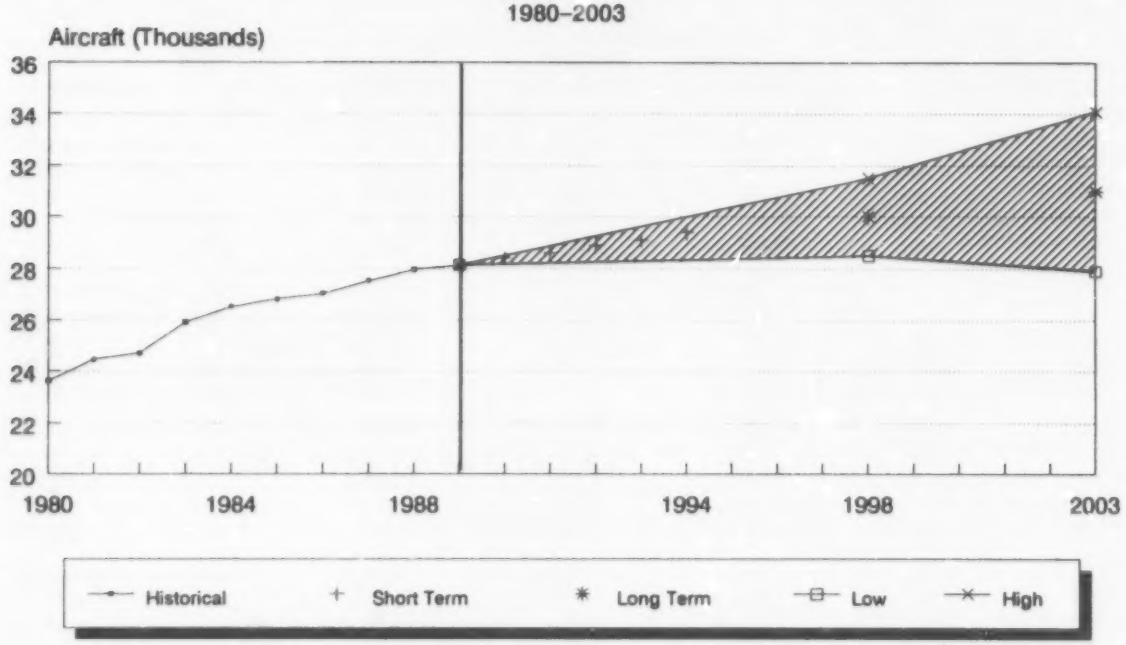
	AIRPORT	1989 TOTAL	1989 PERCENT OF TOTAL	1989 CUMULATIVE PERCENT	1998 TOTAL (THOUSANDS)	2003 TOTAL (THOUSANDS)
1	Lester B. Pearson	348,264	9.7%	9.7%	437.7	494.0
2	Vancouver Int'l	325,036	9.0%	18.7%	396.0	441.0
3	Dorval Int'l	231,304	6.4%	25.2%	277.4	306.6
4	Calgary Int'l	193,585	5.4%	30.5%	207.8	236.2
5	Ottawa Int'l	133,291	3.7%	34.3%	168.9	188.5
6	Edmonton Mun.	128,380	3.6%	37.8%	130.9	144.0
7	Victoria	127,374	3.5%	41.4%	181.7	199.1
8	Winnipeg Int'l	117,279	3.3%	44.6%	135.7	141.0
9	Québec	98,394	2.7%	47.4%	116.0	127.6
10	Halifax Int'l	93,297	2.6%	50.0%	112.4	126.7
11	St. Hubert	73,635	2.0%	52.0%	79.5	85.7
12	London	65,024	1.8%	53.8%	74.8	81.2
13	Edmonton Int'l	64,264	1.8%	55.6%	73.1	85.3
14	Saskatoon	62,982	1.8%	57.4%	79.3	88.3
15	Abbotsford	62,011	1.7%	59.1%	76.7	84.3
16	Regina	56,524	1.6%	60.7%	69.3	76.5
17	Thunder Bay	55,457	1.5%	62.2%	82.2	87.2
18	Sudbury	51,586	1.4%	63.6%	65.3	72.6
19	Hamilton	51,381	1.4%	65.1%	60.7	66.9
20	Pitt Meadows	51,315	1.4%	66.5%	61.0	68.4
21	Moncton	49,561	1.4%	67.9%	52.9	55.6
22	Mirabel Int'l	49,473	1.4%	69.3%	60.6	70.1
23	St. John's	45,930	1.3%	70.5%	65.8	73.9
24	Langley	43,597	1.2%	71.7%	46.9	51.1
25	Windsor	40,564	1.1%	72.9%	84.0	58.8
26	Springbank	36,485	1.0%	73.9%	50.8	53.3
27	Gander Int'l	35,503	1.0%	74.9%	45.4	50.3
28	North Bay	34,624	1.0%	75.8%	44.2	47.9
29	Thompson	34,116	0.9%	76.8%	44.2	48.8
30	Yellowknife	33,555	0.9%	77.7%	47.0	52.7
31	Kelowna	33,420	0.9%	78.6%	44.7	49.3
32	St. Andrews	32,911	0.9%	79.6%	37.4	39.0
33	Sept Iles	32,513	0.9%	80.5%	44.5	48.6
34	Prince George	32,161	0.9%	81.4%	37.8	40.9
35	Timmins	32,051	0.9%	82.3%	41.5	44.6
36	Campbell River	31,308	0.9%	83.1%	43.7	48.4
37	Sault Ste. Marie	31,218	0.9%	84.0%	39.5	42.5
38	Fredericton	28,669	0.8%	84.8%	32.6	34.5
39	Saint John	28,168	0.8%	85.6%	35.0	37.4
40	Kamloops	27,122	0.8%	86.3%	34.1	37.3

Table 6–7 (Cont'd)
Total Itinerant Aircraft Movements

AIRPORT	1989 TOTAL	1989 PERCENT OF TOTAL	1989 CUMULATIVE PERCENT	1998 TOTAL (THOUSANDS)	2003 TOTAL (THOUSANDS)
41 Whitehorse	26,006	0.7%	87.1%	31.1	33.6
42 Fort McMurray	25,626	0.7%	87.8%	29.8	31.5
43 Penticton	24,445	0.7%	88.4%	26.5	28.4
44 Lethbridge	23,940	0.7%	89.1%	29.3	32.4
45 Grande Prairie	23,066	0.6%	89.8%	33.9	36.4
46 Fort St. John	22,502	0.6%	90.4%	22.2	24.3
47 Villeneuve	21,628	0.6%	91.0%	27.0	28.3
48 Charlottetown	21,167	0.6%	91.6%	27.3	29.4
49 Val d'Or	19,914	0.6%	92.1%	29.4	31.2
50 Deer Lake	19,899	0.6%	92.7%	26.7	29.0
51 Inuvik	19,281	0.5%	93.2%	22.9	27.0
52 Port Hardy	18,895	0.5%	93.7%	26.5	28.4
53 Terrace	16,722	0.5%	94.2%	19.7	21.6
54 Baie Comeau	16,635	0.5%	94.7%	16.9	18.6
55 Norman Wells	15,897	0.4%	95.1%	19.5	22.5
56 Sydney	14,969	0.4%	95.5%	17.1	20.0
57 Castlegar	14,755	0.4%	95.9%	17.9	18.9
58 Cranbrook	14,502	0.4%	96.3%	20.4	22.0
59 Fort Nelson	13,553	0.4%	96.7%	13.1	14.3
60 Mont Joli	13,272	0.4%	97.1%	17.4	19.0
61 Sandspit	12,871	0.4%	97.4%	18.4	20.7
62 Rouyn/Noranda	12,560	0.3%	97.8%	21.3	23.4
63 Sarnia	10,182	0.3%	98.1%	7.8	8.7
64 Fort Smith	9,907	0.3%	98.4%	8.4	8.6
65 Prince Rupert	9,484	0.3%	98.6%	14.3	16.9
66 Wabush	9,048	0.3%	98.9%	12.8	14.4
67 Hay River	8,997	0.3%	99.1%	10.7	12.0
68 Churchill	7,556	0.2%	99.3%	11.1	12.3
69 Watson Lake	7,265	0.2%	99.5%	10.0	10.4
70 Stephenville	7,044	0.2%	99.7%	12.9	14.0
71 Fort Simpson	5,583	0.2%	99.9%	6.3	6.9
72 Charlo	4,161	0.1%	100.0%	5.3	5.7
73 Goose Bay	104	0.0%	100.0%	44.7	50.4
74 Dryden**	0	0.0%	100.0%	14.6	17.8
TOTAL	3,594,788			4,462.2	4,925.1
Toronto Island	51,134	1.4%		126.9	139.8

NOTE: Saguenay, Comox and Uranium City excluded.
** In 1989, no AMS statistics are available.

Figure 6–16
Registered Aircraft
National Total
1980–2003



6.5 NUMBER OF REGISTERED AIRCRAFT

The number of aircraft movements at airports in Canada depends to a large degree on the number of aircraft registered and available to use airport facilities. The fleet of registered aircraft has two distinct components: (i) air carriers (about 21%) and (ii) general-aviation aircraft (the remainder). Figure 6–16 and Table 6–8 present the recent trends and the forecasts for this indicator. In addition, Table 6–8 provides a regional summary of aircraft registered in Canada.

Note: In previous forecast reports, the information about the number of registered aircraft pertained only to aircraft with a valid Certificate of Airworthiness. Because current data do not segregate aircraft with a Certificate of Airworthiness, the present report is initiating a new series covering all registered aircraft.

In 1989, the number of registered aircraft was 28,121, an increase of 0.6% over 1988.

For the subperiod 1989–1998 the number of registered aircraft is expected to increase by slightly more than 0.7% a year, to a total of 30,000 in 1998. For 1998 to 2003, the rate of increase is forecast to be just under 0.7% annually, to a total fleet of 31,000 registered aircraft in 2003.

The slow growth rate foreseen for the Canadian aviation fleet is due to high aircraft ownership and operating costs, (especially for general-aviation recreational flyers) and the reluctance of businesses to invest in corporate aircraft. High interest rates, steep liability-insurance costs to aircraft manufacturers, low-volume production and the relative strength of the U.S. dollar are all contributing to the high cost of aircraft. Other causes of the slow growth in the number of aircraft are the large supply of used aircraft and the continued lack of activity in resource exploration and development, which have stimulated equipment acquisition in the past.

6.6 NUMBER OF AVIATION LICENSED PERSONNEL

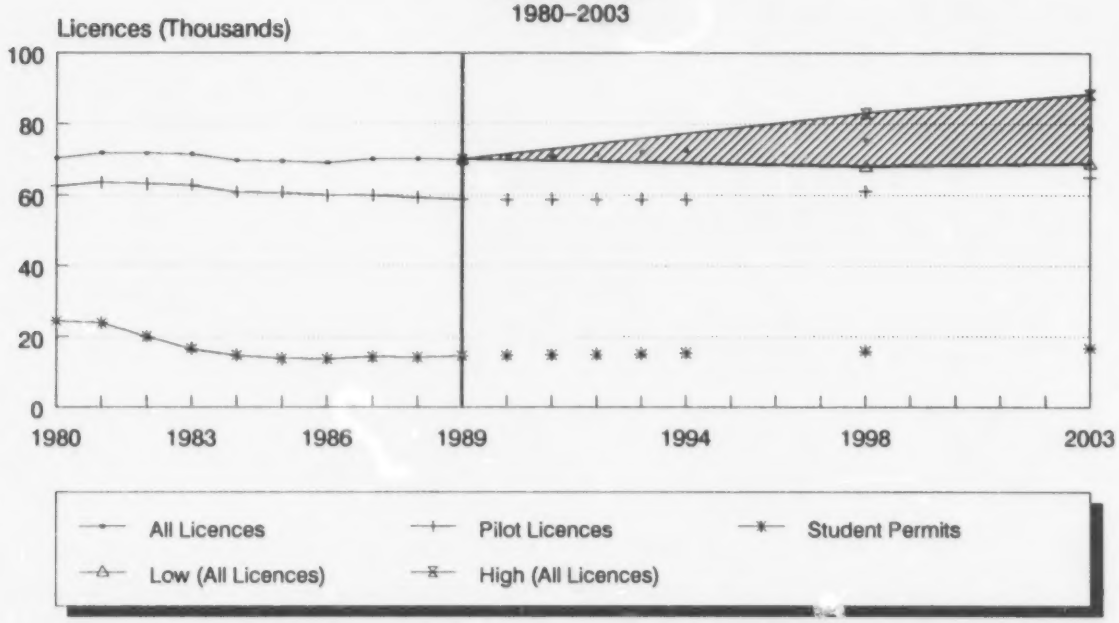
The term "Aviation Licensed Personnel" applies to pilots (except student pilots), flight navigators, flight engineers, air traffic controllers and aircraft maintenance engineers. Licensed pilots traditionally account for about 84% of total licensed personnel (Table 6–9). Growth in the pilot population has been

Table 6–8
Registered Aircraft

YEAR	REGIONAL TOTAL						NATIONAL TOTAL	NATIONAL COMMERCIAL	ULTRALIGHT FLEET
	ATLANTIC	QUEBEC	ONTARIO	CENTRAL	WESTERN	PACIFIC			
1980	894	3,223	6,127	4,387	4,927	4,066	23,624	6,222	
1981	896	3,241	6,226	4,496	5,223	4,355	24,437	6353	
1982	906	3,219	6,267	4,608	5,317	4,365	24,682	6,110	
1983	965	3,367	6,751	4,763	5,414	4,639	25,899	5,813	1,282
1984	1,017	3,531	6,989	4,888	5,423	4,666	26,514	5,605	1,971
1985	1,046	3,674	7,121	4,883	5,452	4,625	26,801	5,517	2,376
1986	1,063	3,828	7,272	4,885	5,423	4,556	27,027	5,466	2,706
1987	1,073	4,012	7,557	4,774	5,390	4,711	27,517	5,561	2,946
1988	1,119	4,203	7,748	4,664	5,336	4,881	27,951	5,713	3,105
1989	1,109	4,418	7,772	4,554	5,232	5,036	28,121	5,816	3,212
1998	1,150	4,700	8,300	4,850	5,600	5,400	30,000	6,600	3,750
2003	1,190	4,930	8,650	4,920	5,710	5,600	31,000	6,900	3,900
	AVERAGE ANNUAL GROWTH RATE, %								
1989–1998	0.4	0.7	0.7	0.7	0.8	0.8	0.7	1.4	1.7
1989–2003	0.5	0.8	0.8	0.6	0.6	0.8	0.7	1.2	1.4

NOTE: The sum of the 6 regions may not necessarily always add to the National Total due to
(i) the exclusion of Canadian government aircraft stationed overseas, and
(ii) the regional totals might not have been taken from the same version of the Register from which the national totals were taken, since the Register is updated constantly.

Figure 6–17
Aviation Licensed Personnel
National Total
1980–2003



stunted by a decline in the number of student pilots, as measured by the number of student permits issued.

Student and private pilots make up the largest group of licensed personnel. Their numbers grew steadily until 1982 when the number of student pilots decreased by 16%. Their numbers continued to decrease for some years and are not expected to regain their 1983 level of 16,700 before the turn of the century. If the current low interest in flying training continues and the military does not make up the difference, the air carrier industry may be faced with boosting its own training programs to ensure an adequate supply of qualified pilots, especially as new, more sophisticated aircraft are delivered.

The ranks of commercial pilots have continued to grow since 1984 and are expected to exceed 21,000 in 1998 and 22,000 in 2003. The historical trends and forecasted levels for Aviation Licensed Personnel are presented in Figure 6–17 and broken down by region in Table 6–9.

6.7 NUMBER OF HOURS FLOWN

Figure 6–18 and Table 6–10 present the forecast of the number of hours flown by Canadian-registered aircraft. This forecast is made in conjunction with the itinerant movement forecasts and is derived from data collected from the "Condition and Conformity Inspection (CCI) Report" of Transport Canada.

For the forecast period, it is anticipated that hours flown by air carriers will increase at a faster rate than that of aircraft movements. The period of dramatic increases in numbers of aircraft movements by regional and local carriers has ended. The number of hours flown by air carriers will be stimulated by the expansion of international traffic.

The number of hours flown by general aviation is expected to increase at a slightly slower rate than the number of GA aircraft movements until 1998, and from 1998 to 2003 the growth in hours flown will increase at about the same rate as aircraft movements.

Table 6–9
Aviation Licensed Personnel and Permits

YEAR	REGIONAL TOTAL						NATIONAL TOTAL			
	ATLANTIC	QUEBEC	ONTARIO	CENTRAL	WESTERN	PACIFIC	PILOTS	COMMERCIAL PILOTS	ALL LICENCES	STUDENT PERMITS
1980	3,977	10,287	20,738	10,574	11,869	12,505	62,468	16,882	70,307	24,506
1981	4,046	10,550	20,617	10,826	12,425	13,027	63,450	17,721	71,822	23,996
1982	4,074	10,629	20,752	10,741	12,466	12,595	63,049	17,891	71,615	20,081
1983	4,061	10,526	21,069	10,615	12,398	12,371	62,677	17,838	71,405	16,658
1984	3,992	10,260	20,604	10,523	12,055	11,915	60,838	17,363	69,734	14,850
1985	3,947	10,626	20,853	10,205	11,599	11,820	60,676	17,597	69,484	13,838
1986	4,102	10,688	20,464	10,032	11,435	11,832	59,808	17,684	69,081	13,798
1987	4,122	11,149	21,433	9,768	10,885	12,251	59,822	18,094	70,098	14,352
1988	4,157	11,067	21,606	9,787	10,836	12,174	59,306	18,384	70,094	14,256
1989	4,343	11,322	20,732	9,378	11,016	12,669	58,656	18,734	69,952	14,686
1998	4,600	12,100	22,700	10,000	11,800	13,700	61,000	21,200	75,400	16,000
2003	4,900	12,600	23,500	10,300	12,300	14,400	65,000	22,200	78,500	16,900
	AVERAGE ANNUAL GROWTH RATE, %									
1989–1998	0.6	0.7	1.0	0.7	0.8	0.9	0.4	1.4	0.8	1.0
1989–2003	0.9	0.8	0.9	0.7	0.8	0.9	0.7	1.2	0.8	1.0

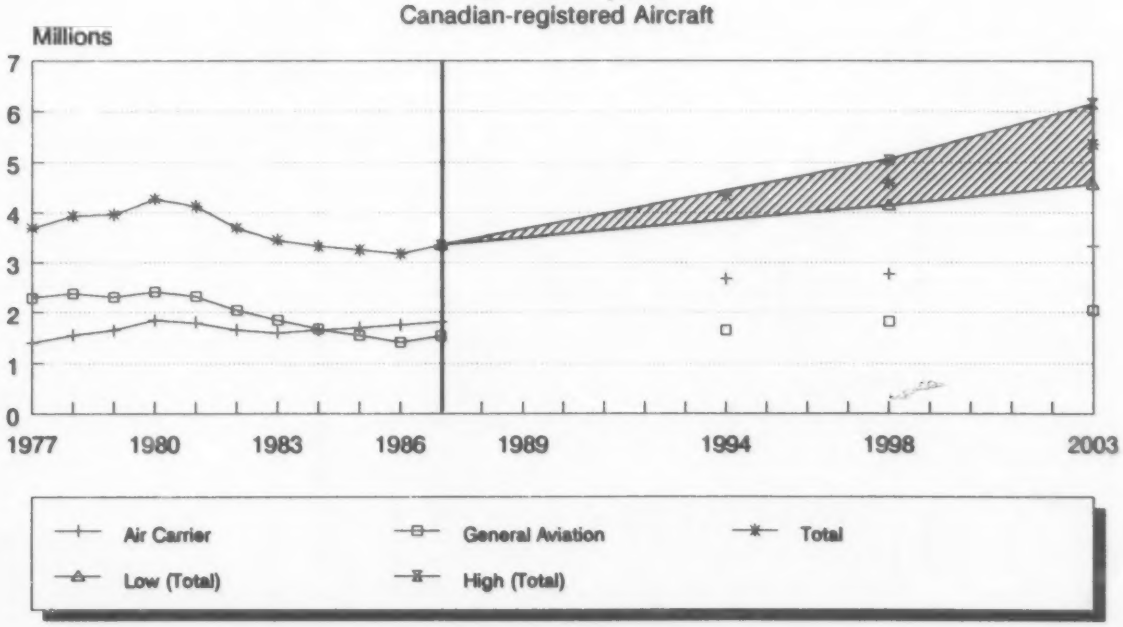
* Totals of licences by region do not equal grand totals due to Canadian licences held in other countries.

Table 6–10
Aviation Hours Flown

YEAR		AIR CARRIER	GENERAL AVIATION	TOTAL
1977		1,397,682	2,290,331	3,688,013
1978		1,553,290	2,378,651	3,931,941
1979		1,652,319	2,308,461	3,960,780
1980		1,846,128	2,419,060	4,265,188
1981		1,796,792	2,326,496	4,123,288
1982		1,647,900	2,040,813	3,688,713
1983		1,594,746	1,852,531	3,447,277
1984		1,649,452	1,672,748	3,322,200
1985		1,703,633	1,552,647	3,256,280
1986		1,760,422	1,414,037	3,174,459
1987		1,810,809	1,535,710	3,346,519
1998	LOW	2,544,000	1,657,000	4,201,000
	MED	2,773,000	1,816,000	4,589,000
	HIGH	3,189,000	2,029,000	5,218,000
2003	LOW	2,697,000	1,855,000	4,552,000
	MED	3,317,000	2,040,000	5,357,000
	HIGH	3,930,000	2,305,000	6,235,000
AVERAGE ANNUAL GROWTH RATE, % (MEDIUM FORECAST)				
1987–1998		4.0	1.5	2.9
1987–2003		3.9	1.8	3.0

SOURCE: Condition & Conformity Inspection (CCI) Report and Air Carrier Reporting Statements.
NOTE: "Air Carrier" split is derived by applying Air Carrier proportion as reported on NTA reports against "Commercial" category reported on Airworthiness Information reports. GA reflects the remainder from the CCI total figure.

Figure 6–18
Hours – All Airports
Canadian-registered Aircraft



APPENDIX A
ALTERNATIVE SCENARIOS

1. RATIONALE

Although we feel confident about our base-case socio-economic forecast and our air-related assumptions presented in Chapters 2 and 3, respectively, we recognize that in many cases the events that unfold may be somewhat at variance with the assumptions underlying our forecasts. In general, a base-case forecast may eventually have to be replaced by an alternative scenario under one or more of the following conditions.

a) A *sudden* change occurs, or *new* information becomes available. The new condition may derive from a new government policy announcement or from a world event certain to have an influence on the Canadian economy. Examples would be the invasion of Kuwait and the cessation of Iraqui oil exports which resulted in a sudden jump in oil prices or an important but unforeseen change in the U.S. economy.

b) A project has been officially scheduled for a certain date in the future and has been incorporated in the base-case scenario, but, as its starting date approaches, may not go ahead as planned. The link between PEI and New Brunswick may be a case in point.

c) A policy has been announced, timetabled for implementation and duly incorporated in the base case, but in the meantime the magnitude of its eventual impact is becoming less certain. An example would be the uncertainty that developed between the announcement of the GST and its passage by Parliament.

d) At the time of forecasting, change is taking place, but its *impact* is not yet predictable for incorporation in the base case. The politico-economic changes in Eastern Europe are a case in point.

Information included in a base-case scenario is considered by the forecaster to reflect the situation most likely to occur. However, a new development may call for an assessment of a situation different from the one described in the base case. It is in such cases that alternative scenarios become important.

Consequently, we have designed two alternative scenarios dubbed "low growth" and "high growth". Section 2 of this appendix outlines two sets of alternative macroeconomic assumptions, Section 3 presents the alternative scenarios themselves, and Section 4 translates the preceding into "low" and a "high" alternative aviation forecasts.

2. MACROECONOMIC ALTERNATIVES

The design of a macroeconomic alternative scenario involves not only modifying one or more basic assumptions, but also changing related assumptions accordingly in order to give a consistent view of a new situation. Ideally, as many related assumptions as possible should be altered to accord with the fundamental changes, but one is sometimes faced with uncertainty in assigning an appropriate value to some related variables. The variable of population is a particular case in point. At present, we consider evidence relating socio-economic changes to population changes to be weak and have therefore chosen to keep the same population assumption in the three sets of macroeconomic alternatives.

The basic assumption that we have chosen to alter is that concerning the economic growth of Canada's largest trading partner, the U.S. A drop in U.S economic activity usually leads to a drop in economic activity in Canada and vice versa. The low-growth alternative is based on an increase in U.S. interest rates while the high-growth alternative is based on an increase in U.S. trade. The two alternatives, as well as the base case, are presented in Table A–1 below.

Table A–1
Alternative Economic Indicators, 1989–2003
Annual Average % Change

	LOW GROWTH	BASE CASE	HIGH GROWTH
GDP (real)	2.2	2.5	2.8
PRDI/Capita (real)	0.9	1.0	1.2
CPI	5.1	4.8	4.2

The difference between either of the two macro-economic alternatives and the base case may not seem to be as great as one may have expected. With respect to the low-growth alternative, the principal reason for the small difference is that, when world growth stagnated in 1986, governments from the seven large industrial economies met to co-ordinate interest-rate policies; that measure which helped sustain economic growth at the time, continues to safeguard against high interest rates. In addition, although our base-case scenario is built on the assumption that high interest rates are expected to drop, we do not expect the drop to be precipitous.

3. THE SCENARIOS

a) Low-Growth Scenario

In this scenario, U.S. interest rates continue to increase, lowering investments and consumers' purchases of large-ticket items. Economic growth is lowered, the U.S. dollar depreciates and prices increase in response to higher import prices, to the internalization of increased debt charges into the prices of goods and services, and to higher wage demands. Soon, the Bank of Canada duplicates the restrictive U.S. monetary policy, which translates into similar adverse effects in Canada. In addition, lower U.S. growth leads to lower Canadian exports to the U.S. Faced with increased debt charges, governments reduce spending and increase taxes, resulting in higher prices, reduced economic growth and lower PRDI/Capita in Canada.

In addition to these changes, further impacts upon the aviation industry itself will act to reduce the traffic forecasts. These include higher oil prices, which will increase fuel costs, and lower levels of labour productivity, further increasing operating costs. These operating constraints along with a lower level of competitive pressure in the industry will be translated into higher air fares than are forecast in the base-case scenario.

b) High-Growth Scenario

In this scenario, world demand for U.S. goods increases, thus leading to an increase in U.S. economic activity. In turn, Canadian exports to the U.S. increase, and Canadian economic growth and PRDI/Capita are higher. Despite the existence of bottlenecks and price increases in some industries, greater access to the larger U.S. market prompts business to increase investment and productivity, which more than compensate for those price hikes.

The Canadian airline industry, under this alternative, will experience greater pressures to reduce fares in a more competitive environment. Also, costs will be lower than in the base case due to lower world oil prices and greater labour productivity. These factors, in addition to a favourable economic climate, will help to increase levels of aviation traffic forecast for the future.

4. ALTERNATIVE AVIATION FORECASTS

Under the conditions described for the low- and high-growth scenarios, the forecasting models yield different growth rates for the aviation demand indicators. The growth rates for the three scenarios, including the base case, are summarized in Table A–2.

Table A–2
Alternative Aviation Traffic Forecasts, 1989–2003
Annual Average % Change

	LOW	BASE CASE	HIGH
Passengers (E&D)	2.9	4.1	5.2
Cargo (E&D)	2.0	3.5	5.0
Movements (Itin.)			
Air Carrier	1.2	2.6	3.9
GA	1.4	1.8	2.4
Total	1.3	2.1	3.1

APPENDIX B
ACCURACY OF TRANSPORT CANADA AVIATION FORECASTS

The accuracy of a forecast depends on, among other things, the forecasting method used. In the case of a forecast obtained with the aid of an econometric model, the accuracy of the forecast depends on (1) the method itself, (2) the forecasts of the independent variables, and (3) the forecaster's judgment.

Although it is recognized that every forecast contains errors, the user's confidence in the forecast and ultimately in the forecasting organization is nevertheless directly related to the accuracy of the forecast. To ascertain the accuracy of Transport Canada's aviation-activity forecasts, three studies have been completed. Table B-1 below presents the results of one of these studies.

The mean absolute percent errror is defined as follows:

$$\text{MAPE} = (1/n) \left[\frac{|P_i - A_i|}{A_i} \right] \times 100\%$$

where MAPE = mean absolute percent error
n = the number of periods over which the average is taken
P_i = the forecast value in period i
A_i = the actual value in period i
| | = the absolute value indicator

The quantity within the summation sign is called the absolute percent error or APE.

Table B–1
Mean Absolute Percent Errors of Forecast Parameters

FORECAST PARAMETER	FORECAST YEAR										ROW MAPE
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	
Passengers	7.7*	6.7	3.0	18.2	18.1	13.9	14.5	5.6	6.1	9.6	10.3
Air Cargo	4.4	15.8	15.9	20.7	16.6	16.5	12.4	6.7	NA	NA	13.6
A/C Movements	5.3	3.9	5.1	21.0	19.4	16.0	14.6	9.2	7.8	5.1	10.7
Aircraft	3.1	4.0	3.6	5.4	4.7	4.4	4.8	5.7	NA	NA	4.5
Pilots	0.2	4.0	2.1	3.2	4.6	9.9	10.9	14.2	NA	NA	6.1
Column MAPE	4.1	6.9	5.9	13.7	12.7	12.1	11.4	8.3			
Overall Row MAPE	9.0										
Overall Column MAPE	9.4										
Grand MAPE	10.9										

* The numbers are percentages representing the average error of all forecasts (grand total) made for the corresponding parameter and year in the previous years. The 7.7, for example, is the percentage representing the average error of all passenger forecasts made for 1979 in the years before 1979.

It is important to bear in mind that the error averages stated above cannot be taken as sure indications of the forecasting performance of the organization in the future, for the simple reason that it can never be established that the methods or conditions that led to a given performance will be repeated.

Details of this accuracy study are contained in the report *An Evaluation of the Accuracy of Aviation-Activity Forecasts* (TP 9032E). In addition to Transport Canada's aviation forecast accuracy, the report contains information on the forecast accuracy of the U.S. Federal Aviation Administration, the North Atlantic Traffic Forecasting Group, the International Air Transport Association, and the Boeing and McDonnell Douglas aircraft corporations. The report also describes the methodology used in determining the accuracy results and specifies wether the forecasts in question proved to be overpredictions or underpredictions. For a copy of the report please call the Air Statistics and Forecasts Branch at (613) 993–9837.

APPENDIX C
FORECASTING METHODOLOGY

1. LONG-TERM FORECASTING TECHNIQUES

1.1 Passenger and Scheduled-Aircraft-Movement Forecasts

To meet the demand for consistent and credible aviation-activity forecasts, Transport Canada has been developing a national forecasting system of state-of-the-art models (Figure C–1). Now, four main models have been completed and used to arrive at the forecasts described in this report. They are the Passenger Origin-Destination Model (PODM), the Passenger Traffic Allocation Model (PTAM), the Air Cargo and Mail Model and the Canadian General Aviation Dynamics Model (CANGAD). Details of these and other forecasting models used by the Statistics and Forecasts Branch are available in separate reports, listed at the end of this appendix.

The Passenger Origin-Destination Model (PODM)

PODM is an econometric model the primary function of which is to provide input to PTAM in the form of scheduled origin-and-destination (O&D) air passengers. The model is disaggregated by sector, trip-purpose and direction of travel. The sectors are Domestic, Transborder, and Other International. In the Domestic sector, Canada is divided into 60 zones. In the Transborder sector, the U.S. is divided into 23 zones, and in the Other International sector the rest of the world is divided into 8 zones. The trip purposes are business and nonbusiness (for the Domestic and Transborder sectors only) and the direction is by ticket origin. The formulation of PODM is as follows:

Domestic and Transborder Business Trips

$$T_{ijBF} = T_{ijBA}\left[\frac{G_{iF}}{G_{iA}}\right]^{0.866} \times \left[\frac{G_{jF}}{G_{jA}}\right]^{0.770} \times \left[\frac{M_{ijBF}}{M_{ijBA}}\right]^{-0.253} \times \left[\frac{e^{L_{ijBF}}}{e^{L_{ijBA}}}\right]^{0.387} \times \left(1 + G_B\right)$$

where

(G_{iA}, G_{iF}) and (G_{jA}, G_{jF}) denote per capita gross provincial product of zones i and j, respectively, with "A" representing actual figures for the base year and "F" representing forecast figures for the forecast year;

M_{ij} and L_{ij} are competition from the other modes relative to air and quality of air service, respectively, for business travel;

e is the natural logarithm base;

T_{ijBA}, T_{ijBF} denote business trips between i and j for the base year and forecast year, respectively; and

$(1+G_B)$ is a residual trend multiplier representing other influences on business travel.

Domestic and Transborder Nonbusiness (Except "Sunspots") Trips

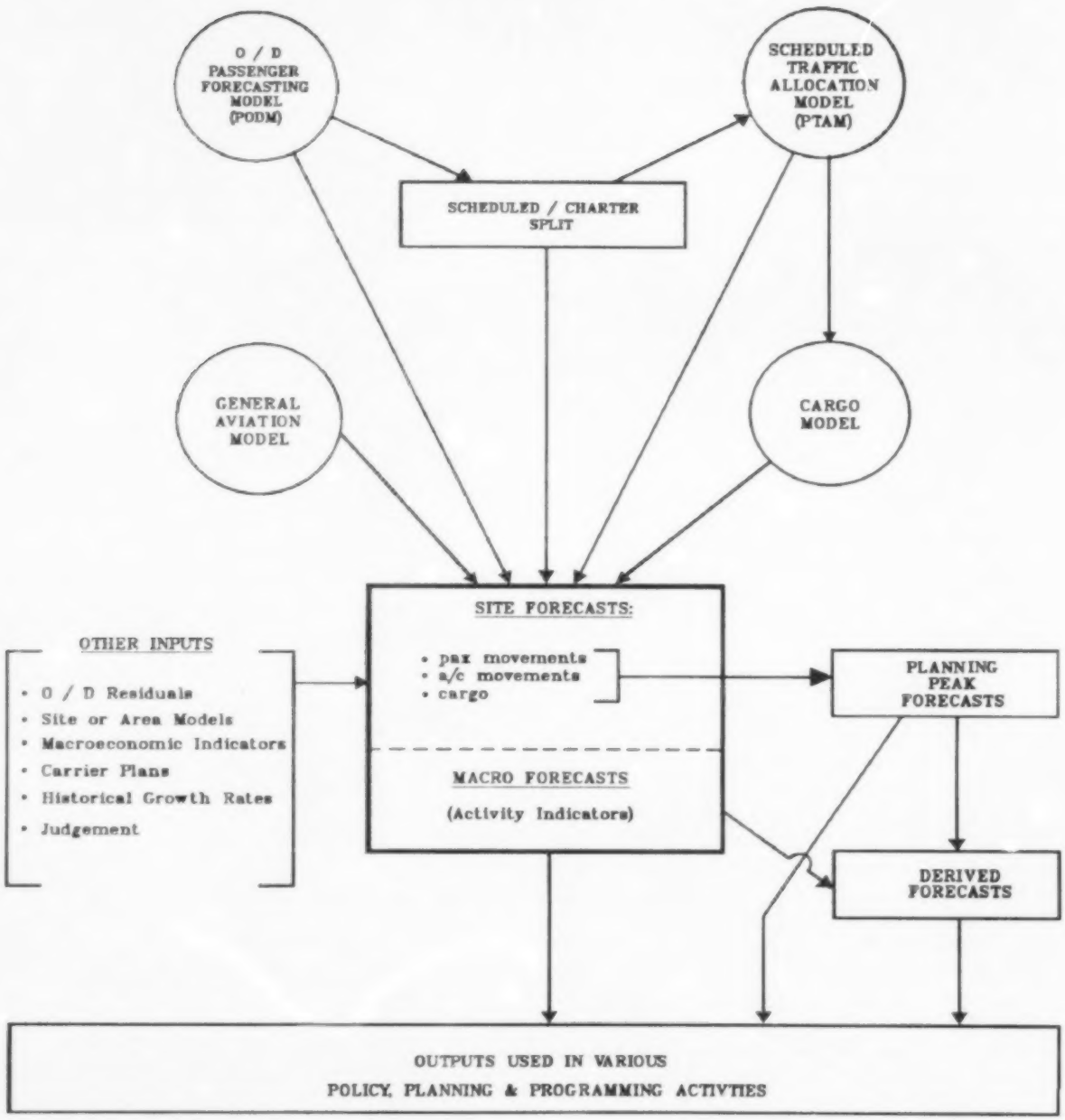
$$T_{ijNF} = T_{ijNA}\left[\frac{P_{iF}}{P_{iA}}\right]^{0.736} \times \left[\frac{P_{jF}}{P_{jA}}\right]^{0.907} \times \left[\frac{I_{iF}}{I_{iA}}\right]^{2.195} \times \left[\frac{C_{ijF}}{C_{ijA}}\right]^{-1.357} \times \left[\frac{M_{ijNF}}{M_{ijNA}}\right]^{-0.366} \times \left[\frac{e^{L_{ijNF}}}{e^{L_{ijNA}}}\right]^{0.122} \times \left(1 + G_N\right)$$

where

(P_{iA}, P_{iF}) and (P_{jA}, P_{jF}) denote adult population (20 years and over) in zones i and j, respectively, with "A" representing actual figures for the base year and "F" representing forecast figures for the forecast year;

I_{iA}, I_{iF} denote per capita real personal disposal income for zone i, lagged one year, for the base year and forecast year, respectively;

Figure C–1
National Forecasting System



T_{ijNA}, T_{ijNF} denote nonbusiness trips between i and j for the base year and forecast year, respectively;

C_{ijA}, C_{ijF} denote air fares between i and j for the base year and forecast year, respectively;

M_{ijA}, M_{ijF} denote modal competition from the other modes relative to air, for nonbusiness travel for the base and forecasted year, respectively;

L_{ijNA}, L_{ijNF} denote quality of air service for nonbusiness travel, for the base year and forecast year, respectively;

e is the natural logarithm base; and

$1+G_N$ is a residual trend multiplier representing other influences on nonbusiness travel.

Trips from Canada to U.S. "Sunspots"

$$\left[\frac{T_{ijF}}{P_{iF}}\right] = \left[\frac{T_{ijA}}{P_{iA}}\right] \times \left[\frac{I_{iF}}{I_{iA}}\right]^{2.195} \times \left[\frac{Y_F}{Y_A}\right]^{-1.357} \times \left(1 + G_N\right)$$

where

T_{ijF}, T_{ijA} denote the total number of annual air trips between zone i and zone j in both directions in the forecast year and base year, respectively;

P_{iF}, P_{iA} denote the adult population (20 years and over) in zone i in the forecast year and base year, respectively;

I_{iF}, I_{iA} denote the per capita real personal disposal income for zone i, lagged one year, for the forecast year and base year, respectively;

Y_F, Y_A denote the average yield (cents per passenger-km) for the forecast year and base year, respectively; and

$1+G_N$ is a residual trend multiplier representing other influences on sunspot air travel.

Other International Trips

Canadian Origin Model

To Europe

$$T_{ijF} = T_{ijA}\left[\frac{P_{iF}}{P_{iA}}\right]^{1.879} \times \left[\frac{G_{iF}}{G_{iA}}\right]^{0.717} \times \left[\frac{Y_{jF}}{Y_{jA}}\right]^{-1.108} \times \left(1 + G_F\right)$$

To Caribbean or South America

$$T_{ijF} = T_{ijA}\left[\frac{P_{iF}}{P_{iA}}\right]^{2.042} \times \left[\frac{G_{iF}}{G_{iA}}\right]^{2.324} \times \left[\frac{Y_{jF}}{Y_{jA}}\right]^{-0.692} \times \left(1 + G_F\right)$$

To Asia or Africa

$$T_{ijF} = T_{ijA}\left[\frac{P_{iF}}{P_{iA}}\right]^{1.724} \times \left[\frac{G_{iF}}{G_{iA}}\right]^{1.547} \times \left[\frac{Y_{jF}}{Y_{jA}}\right]^{-3.927} \times \left(1 + G_F\right)$$

Foreign Origin Model

From Europe

$$T_{ijF} = T_{ijA}\left[\frac{P_{jF}}{P_{jA}}\right]^{1.929} \times \left[\frac{PG_{iF}}{PG_{iA}}\right]^{1.016} \times \left[\frac{Y_{iF}}{Y_{iA}}\right]^{-1.108} \times \left(1 + G_F\right)$$

From Caribbean or South America

$$T_{ijF} = T_{ijA}\left[\frac{P_{jF}}{P_{jA}}\right]^{2.329} \times \left[\frac{PG_{iF}}{PG_{iA}}\right]^{1.178} \times \left[\frac{Y_{iF}}{Y_{iA}}\right]^{-0.692} \times \left(1 + G_F\right)$$

From Asia or Africa

$$T_{ijF} = T_{ijA}\left[\frac{P_{jF}}{P_{jA}}\right]^{2.114} \times \left[\frac{PG_{iF}}{PG_{iA}}\right]^{1.606} \times \left[\frac{Y_{iF}}{Y_{iA}}\right]^{-3.927} \times \left(1 + G_F\right)$$

where

T_{ijF}, T_{ijA} denote the total number of air trips between zone i and zone j in the forecast year and base year, respectively;

(P_{iF}, P_{iA}) and (P_{jF}, P_{jA}) denote total populations in zone i and zone j, respectively, with "A" representing actual figures for the base year and "F" representing forecast figures for the forecast year;

G_{iF}, G_{iA} denote real gross domestic product for zone i in the forecast year and base year, respectively;

PG_{iF}, PG_{iA} denote real per capita gross domestic product for zone i in the forecast year and base year, respectively;

(Y_{iF}, Y_{iA}) and (Y_{jF}, Y_{jA}) denote the average yield (cents per passenger-kilometre) for zone i and zone j, respectively, with "F" representing the forecast year and "A" the base year; and

$(1 + G_F)$ is the residual trend multiplier representing other influences in Other International air travel.

It should be noted that the equations presented above are forecasting equations. The model itself is a modified gravity model, the parameters of which were estimated by means of ordinary least squares and pooled 1981, 1983, 1985 and 1987 data. Actually, the estimation involved more variables than indicated in the above equations. These additional variables, which include dummy variables unique to a site or to a city-pair, do not appear in the forecasting equations because they have constant values and therefore cancel out.

The Passenger Traffic Allocation Model

This model takes as input the forecasts of scheduled O&D passengers, as obtained from PODM, and converts them into station activity forecasts for major Canadian airports. The activities forecasted are enplaned-and-deplaned (E&D) and arriving-and-departing (A&D) passengers and air-carrier aircraft movements.

There are 60 Domestic, 23 Transborder and 8 Other International zones in PTAM (same number of zones as in PODM). These zones constitute the network encompassing the entire world, as seen from Canada. The network is implicitly defined by zone-pair O&D passenger demands. All foreign zones and major domestic zones are normally treated as "composite" zones representing an aggregate source of O&D demand. For example, the Toronto zone includes a number of smaller cities such as Hamilton and Peterborough.

PTAM is not a self-contained "black box"; it has been designed to require considerable interaction with an analyst. The modelling process is, in fact, an amalgamation of the judgment and intuition of an experienced aviation-activity analyst, the computational ability of the computer and the techniques of operations research.

Basically, PTAM allocates scheduled O&D passengers, by means of linear programming, to different passenger routes, subject to the constraints of aircraft routes, fleet size, acceptable load factors, etc. The objective function employed is a relatively simple expression of the passenger's relative preference for alternative types of routes (e.g., nonstop being preferred to one-stop). The objective function coefficients have been updated through a survey. A passenger route is defined as a path along which a passenger can travel from an origin to a destination by air. There are three types of passenger routes in PTAM: direct, connecting and transiting. Alternatively, an aircraft route is defined in terms of the cities linked by the routing (e.g., VCTM represents an aircraft route linking Vancouver, Calgary, Toronto, and Montreal). In the final stage of PTAM, all the passengers assigned to individual passenger routes are aggregated into E&D and A&D passengers by airport. The model also outputs forecasts of connecting and transiting passengers, plus arriving and departing flights.

Figures C–2 and C–3 illustrate the set-up of a PTAM problem using a three-node network as an example. Figure C–2 illustrates the sets of aircraft and passenger routes linking Toronto, Ottawa, and Montreal in this simplified network. A comma inserted in a passenger route indicates a transit route,

Figure C–2
Characteristics of Three City Network Problem

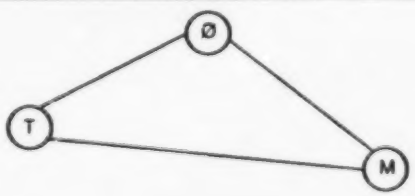
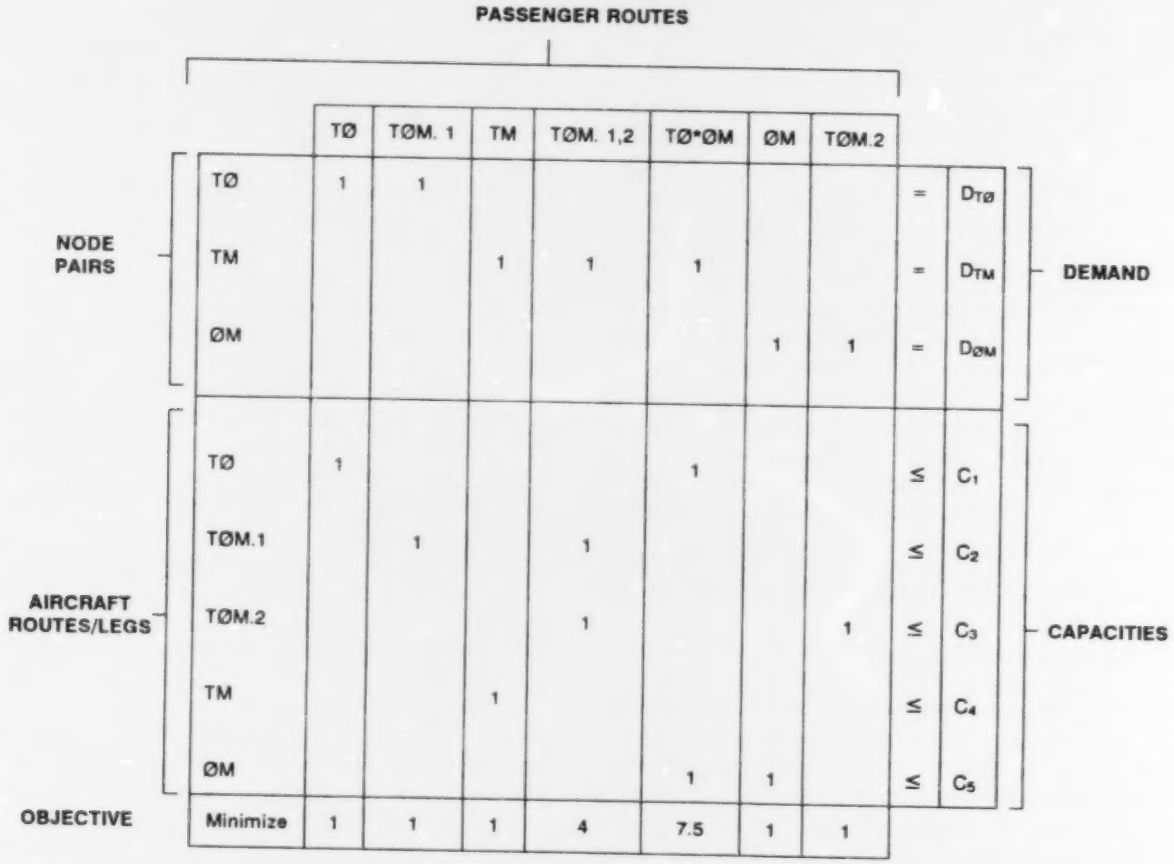
NETWORK	CITY-PAIRS	A/C ROUTES	PAX ROUTES
	TØ	TØ	TØ, TØM.1
	TM	TM, TØM	TM, TØM. 1,2, TØ*ØM
	ØM	ØM	ØM, TØM.2

Figure C–3
L.P. Matrix for Three City Network Problem



an asterisk a connecting route, and a period a portion of an aircraft route (i.e., an aircraft-route leg).

Propensity Models

The Propensity model, a site-specific model, was initially developed for the Toronto Area Airports Project between 1972 and 1974. It was updated in 1976 and again in 1982, and has been used to forecast demand at Pearson International Airport in Toronto. Propensity models have also been developed for both Montreal and Vancouver.

Site-specific forecasting models are considered necessary for airports involving very large capital investments, as is the case with the major airports in Canada. Such models also provide a valuable cross-check against the results of the national models in use in Transport Canada.

The Propensity Model is a trip-generation model that forecasts origin-and-destination (O&D) air trips to and from the area under consideration. In the case of Toronto, the "Toronto Area" is defined (approximately) as the area containing the Toronto, Oshawa, Hamilton, St. Catherines and Kitchener Census Metropolitan Areas (CMAs). Generally, six sectors (Domestic short- and long-haul, Transborder short- and long-haul, Europe, and South) are defined, and statistics reflecting demand to and from these sectors are included in the model. Further disaggregation (e.g., Europe, South, Other, and Transborder Sunspots) is also possible. The catchment population is divided into socio-economic groups defined by family income (both five and six income groups have been used), birthplace (Canada or foreign) and area of residence (CMA or outside).

Based on airport and household surveys, estimates are made of the trip-rate or "trip propensity" of each socio-economic group for each travel sector. The trip propensity of a socio-economic group is defined as the average number of air trips made per person in that group. The resulting number of trips is then modified by estimates of the effects of future changes in fares and service levels of the air mode and competing modes. Changes in air fares are estimated through a detailed airline cost model, which examines past trends and future expectations of airline costs, taking into account, among other things, changes in fuel prices and in productivity. Effects of changes in service levels of the air mode and competing modes have been estimated judgmentally. However, the model can accept an externally produced service factor. For example, in the federal-provincial Southern Ontario Multimodal Passenger Study, explicit consideration was given (by mode) to two elements of service level, namely frequency and trip time, in a Transport Canada multimodal forecasting model.

The Canadian General Aviation Dynamics Model

The Canadian General Aviation Dynamics (CANGAD) Model was designed to produce forecasts of licensed personnel, aircraft demand by type of general-aviation aircraft, aircraft movements, and hours flown, and to answer "what if" questions. The methodological approach used in developing CANGAD is based on a hybrid of econometric and systems-dynamics techniques. The internal behaviour of the general-aviation system is represented by the continuous interactions among its components—pilot supply, aircraft demand and aircraft utilization. For example, a change in pilot supply may be brought about by a change in the "costs" of obtaining licences, in terms of time, money, and regulatory requirements that must be fulfilled.

In addition to depicting the general-aviation world realistically, CANGAD will ensure a consistent set of forecasts for all indicators of general-aviation activity. The numbers of pilots and licences issued will be consistent with the number of hours flown; annual fuel consumption and movements will be consistent with annual hours flown; and so forth.

Although the model represents nationally aggregated levels of Canadian general-aviation activity, it is disaggregated into five distinct user-categories covering five different types of aircraft. The user categories are private, government, public transportation, flying training, and other; the latter three categories are alternatively called the "commercial-use" categories. The five types of aircraft are single-engine piston, multi-engine piston, turboprop, turbojet and helicopter. The combination of user category and aircraft type forms a "subsegment."

The pilot-supply sector of the model recognizes the progression of steps necessary to qualify for advanced licences. The inherent delays encountered in satisfying these requirements are an important part of the model definition. This progression process is stressed because most methods for forecasting pilot populations do so by developing independent forecasts for each licence type. Since pilot upgrading and departing occur continuously over time, the pilot-supply sector must provide for consistency among all licence types.

The aircraft-demand sector distinguishes two types of demand: that for the aircraft itself and that for the service provided by the aircraft. The demand for aircraft owned and operated by (and for) the same individual (e.g., for private use) is a primary demand dependent on the supply of such individuals. These are, of course, active licensed pilots, whose numbers are, in turn, dependent on the cost of flying and on national economic conditions. Alternatively, the demand for aircraft service (e.g., for commercial use) is a primary demand that is a function of the current utilization of the existing fleet that provides these services. The same behavioural distinctions just described as existing in the aircraft-demand sector have been found to exist also in the aircraft-utilization sector.

As an example of the set of equations used in CANGAD, the equations depicting the flying-training subsegment (user category 4) and single-engine piston aircraft (type 1) are presented below:

$$AA(4,1) = DT \times [AAR(4,1) - ADR(4,1)]$$

$$AAR(4,1) = \frac{DAA(4,1) - AA(4,1)}{AT(4,1)}$$

$$ADR(4,1) = ADRN(4,1) \times HF(4,1)$$

$$DAA(4,1) = \frac{HF(4,1)}{DAUR(4,1)}$$

$$DAUR(4,1) = \text{constant}(4,1)$$

$$HF(4,1) = f[VC(4,1)]$$

$$AM(4,1) = MPHF(4,1) \times HF(4,1)$$

$$MPHF(4,1) = \text{constant}(4,1)$$

$$ADRN(4,1) = \text{constant}(4,1)$$

where

AA	=	active aircraft
AAR	=	aircraft-activation rate
ADR	=	aircraft-destruction rate
DAA	=	desired number of active aircraft
AT	=	adjustment time
ADRN	=	aircraft-destruction rate, normal
HF	=	hours flown
DAUR	=	desired aircraft-utilization rate
VC	=	variable cost of operating an aircraft
AM	=	aircraft movements
MPHF	=	movements per hour flown

Since their initial development, the CANGAD equations involving only the exogenous variables have been recalibrated. A second recalibration with more recent data, including enhancements to the cost component of the model, has been completed.

1.2 Planning Peak-Hour Passenger Forecasts

The planning peak-hour passenger (PPHP) forecasts are a primary input to the facility-planning process. The PPHP is defined as the 90th percentile of the annual distribution of hourly passengers. As a planning standard, this definition means that 10% of the annual passengers are expected to arrive in hours busier than the PPHP volume in a given year.

Large Airports

Three methods have been used to forecast the PPHPs for large airports.

By the first method, the mean and standard deviations are computed (one for each year) from the historic hourly frequency distribution. Then the 90th percentile of these distributions is related to the mean and standard deviation in each year. Once this relationship is established, the forecast mean is obtained by dividing the annual E&D passenger forecast by the forecasted total annual hours of operation. The forecast of annual hours of operation is based on comparative analysis of airports having similar roles but various annual passenger volumes. The forecast standard deviation is estimated by modifying the base-year standard deviation by the ratio of the forecast mean to the base-year mean. Finally, the PPHP is calculated from the forecast mean and the forecast standard deviation.

By the second method, a mathematical relationship (linear or non-linear) between PPHP and annual number of passengers is determined for each site.

A third method is used in cases where the critical hourly aircraft combination (occurring on a regular basis) consists of a very small number of aircraft. This method attempts to relate passengers to critical combination of aircraft. It is described more fully below under "Small Airports".

The reasonableness of the resulting PPHP forecasts is judged according to such factors as the location and the role of the airports being considered and compatibility with current PPHPs of other airports.

Small Airports

Since the 90th-percentile standard applies only to large airports, another method is used for small sites.

The first step is to study the current schedule in a "representative" time period (e.g., a quarter) and the forecasted number of aircraft movements in the year under consideration. Judgment is then used to determine the critical combination of aircraft that will arrive (or depart) regularly in the forecast hour. Usually this amounts to only one or two arrivals, since it can reasonably be assumed in many cases that it is to the advantage of the airlines to schedule additional arrivals in hours with traffic less than in the peak.

In the second step, the number of seats per movement in the planning peak hour is forecast on the basis of a forecast of the type(s) of aircraft to be used in the peak hour. This latter forecast involves an estimation of fleet mix, including seating capacity by aircraft type or class.

The information on aircraft mix is usually obtained directly from the airlines concerned or by examining the historical trend in aircraft mix and assessing the likely role of the airport in the future. The final step is to forecast the involvement ratio in the planning peak hour. "Involvement ratio" is defined as the ratio of enplaned (or deplaned) passengers to the number of available seats. In forecasting the involvement ratios, one considers again the location and the role of the particular airport under study. For example, an airport that serves only as a mid-point of a multi-stop route would tend to have a lower involvement ratio than an end-point or a site having high percentage of connecting passengers.

1.3 Air Cargo Forecasts

The air cargo forecasts in this report were produced by means of a regression model that takes into account the effect of such socio-economic variables as the gross domestic product and provincial GDP. The model was disaggregated by sector (Domestic, Transborder and Other International) and direction

(enplaned and deplaned). Specifically, the steps in the methodology are as follows:

a) Forecast national totals;
b) Forecast provincial totals and normalize the results so that they sum to the national totals; and
c) Forecast volumes at each airport within a province and normalize the results so that they sum to the provicial totals.

The model was first calibrated with data up to and including 1977. It was subsequently recalibrated with data available up to and including 1981 and more recently with 1988 data. Most of the model coefficients were found to be relatively stable, and the model has a high explanatory power.

2. SHORT-TERM FORECASTING TECHNIQUES

The short-term forecast methods used consist mainly of time-series analysis ranging from general exponential smoothing to univariate and multivariate ARIMA analysis. Sometimes these time-series analyses are complemented by econometric modelling.

3. OTHER FORECASTING TECHNIQUES

The four major models described above are used mainly to obtain forecasts for major sites generally classified as international, national and regional airports. However, other forecasting techniques, notably those described below, have been used to produce forecasts for small sites and also to complement the major models.

a) Checking consistency with National Trends. The forecast growth rates, particularly with respect to passengers, are developed in terms of comparison with the national average projected by PODM.
b) Library Research. After studying the contents of available file documents and master plans, qualitative socio-economic judgments are made concerning the site under consideration. These judgments are generally expressed as a deviation from the national socio-economic trend. This technique is of particular value for points where local information is especially relevant.
c) Input from users and Regional Offices. The forecasts are discussed with the users and appropriate regional people. Such discussions are necessary to ensure that local knowledge is incorporated. This technique is especially useful in forecasting general-aviation activity.
d) Professional judgment. Professional judgment is always an input to the forecasts.
e) For air-carrier movements specifically, the forecasts are obtained from the annual passenger forecasts by predicting average aircraft capacities and loads.
f) To provide a crosscheck of the enplaned-and-enplaned (E&D) passenger forecasts by the two-model system, PODM and PTAM, an econometric model is used to forecast the aggregate E&D passengers for the "Top-30" airports in Canada. This top-down approach is efficient and accurate.
g) A combination of forecasts is always considered as an alternative to selecting the "best" from a set of forecasts. Such an approach was employed in one of the General Forecast Updates.

Technical Papers And Reports On Forecasting Methods Available From The Air Statistics And Forecast Branch

1. Combination of Forecasts (TP 6624E).
2. Air Passenger Origin-Destination Model (TP 2195).
3. The Recalibrated Passenger Origin-Destination Model—Summary Report (TP 3215).
4. The Respecification and Recalibration of the Passenger Origin-Destination Model (TP 7327E).
5. The 1980 Canadian General Aviation Activity Survey—Summary Report (TP 3221).
6. The Canadian General Aviation Dynamics Model (TP 3775).
7. The Relationship of Quality of Service to Air Travel Demand (TP 4907E).
8. The Passenger Traffic Allocation Model—Summary Report (TP 2411).
9. An update of the PTAM Objective Function Coefficients (TP 6478E).
10. Final Report on the Use of Annual Inputs in PTAM (TP 6334E).
11. A Model for Forecasting Air Travel Demand between Canada and Abroad (TP 6184E).
12. A Model for Forecasting Air Passenger Aggregate Demand (presented at the Fifth ISF in Montreal, June 9–12, 1985).

13. Evaluation of Short-Term Forecasting Techniques for Use with CATA's Aviation Activity Data.
14. Models for Forecasting Regional Air Passengers and Itinerant Aircraft Movements.
15. Models for Forecasting Hours Flown (TP 7388E).
16. An Evaluation of the Forecasting Accuracy of the Domestic Module of PODM (TP 8183E).
17. An Evaluation of the Accuracy of Aviation-Activity Forecasts (TP 9032E).
18. The Accuracy of Some Socio-economic Forecasts used as Input to PODM (TP 9400E).

APPENDIX D
GLOSSARY OF TERMS

AIR CARRIER An aircraft operator licensed by the National Transportation Agency of Canada to transport persons, mail and/or goods by air, for remuneration.

CARGO (see Revenue Cargo)

CHARTER SERVICE The transportation of passengers and/or goods by aircraft when a person other than the air carrier operating the aircraft, and other than the carrier's agent, contracts for a block of seats or a portion of the cargo capacity for that person's own use or for resale in whole or in units to members of the public. For Domestic and Other International charter services, statistics are collected for flights using aircraft having a gross takeoff weight greater than 15,900 kg (35,000 lb.). For Transborder charters, reports are filed for aircraft with a gross takeoff weight greater than 8,200 kg (18,000 lb.).

DEPLANED PASSENGERS/CARGO Passengers, or cargo (including mail) off-loaded from an aircraft at an airport in Canada. Deplanements apply to connecting traffic (interline and intraline transfers) as well as to traffic terminating at that point. If a flight number is changed at an airport, all arriving traffic on the flight is reported as deplaned, even though no off-loadings have occurred.

DOMESTIC SERVICE Air transportation provided on a flight from one point in Canada to another point in Canada.

ENPLANED PASSENGERS/CARGO Passengers, or cargo (including mail) loaded on to an aircraft at an airport in Canada. Enplanements apply to connecting traffic (interline and intraline transfers) as well as to traffic originating at the airport. If a flight number is changed at an airport, all traffic departing on board the aircraft is reported as enplaned, even though no on-loadings have occurred.

GENERAL-AVIATION AIRCRAFT MOVEMENTS All aircraft movements except Air Carrier movements. General Aviation movements consist of Other Commercial, Private and Government (Civil and Military) aircraft movements.

GOODS TONNE-KILOMETRE The measure of the carriage of one tonne of cargo, mail or excess baggage through a distance of one kilometre. The carriage of normal baggage not subject to excess baggage charges is measured in passenger tonne-kilometres (See definition below).

INTERNATIONAL AIR CHARTERS Air transport operations performed by aircraft having a maximum authorized takeoff weight of more than 15,900 kg (35,000 lb.), the entire capacity of which has been engaged by one or a limited number of charterers for flights between Canada and another country. (See Charter Service)

ITINERANT AIRCRAFT MOVEMENTS At airports having control towers and/or flight service stations, an aircraft movement is considered to be itinerant if

a) the aircraft is proceeding to or arriving from another location; or
b) the aircraft leaves the air-traffic-control circuit but will be returning without landing at another airport.

At airports not having control towers or flight service stations, an aircraft movement is considered to be itinerant if

a) the aircraft is arriving from or departing to a point other than the reporting airport; or
b) the aircraft leaves the close proximity of an airport and returns without landing at another airport.

LARGE AIRPORTS ("Top 77" Airports) Airports for which the responsibility for aviation forecasts lies with the Air Statistics and Forecasts Branch of

Transport Canada's Policy and Co-ordination Group (ACAC) in Ottawa.

LICENSED PILOT Any person permitted, by virtue of a valid licence administered by Transport Canada, to operate an aeroplane, helicopter, ultralight, glider, gyroplane or balloon, whether in private, commercial, or government service. As an indicator of aviation activity, the term "Licensed Pilots" refers to the number of pilot licences in force at the end of a given calendar year.

MAJOR CARRIER SERVICES All scheduled services operated by Canadian Level 1 carriers (currently Air Canada and CAIL). In addition, the term applies to scheduled operations of foreign carriers to/from Canada using aircraft with individual gross takeoff weight of more than 30,000 kg (66,000 lb.).

NORTHERN CANADA (the designated area) Under the National Transportation Act, aviation in Canada is subject to different economic regulations in different geographic areas. In that part of Northern Canada referred to in legislation as the "designated area", the Act is applied differently than in the rest of Canada. The designated area is defined as being that part of Canada north of 50 degrees latitude from the Atlantic coast to the Ontario/Manitoba border, then north of the straight diagonal from the intersection of the the 50th degree latitude and the Ontario/Manitoba border to the intersection of the 53rd degree latitude and the Manitoba/Saskatchewan border and the intersection of the 55th degree latitude and the Saskatchewan/Alberta border, and then north of 55 degrees latitude from Alberta to the Pacific coast.

OTHER INTERNATIONAL SERVICE Air transportation provided on a flight between Canada and a foreign point not in the United States (including Alaska and Hawaii). Note: Prior to 1968, Hawaii was included in the statistics for Other International points.

PASSENGER-KILOMETRE The measure of the carriage of one passenger through a distance of one kilometre. A total of passenger-kilometres is obtained by summing the number of kilometres flown by each passenger.

PASSENGER LOAD FACTOR A ratio calculated by dividing the number of passenger-kilometres flown by the number of available seat-kilometres offered.

PASSENGERS (see Revenue Passengers)

PASSENGER TONNE-KILOMETRE The measure of the carriage of one tonne of passengers and their allowed baggage weight through a distance of one kilometre. Passengers and their normal luggage are assigned a standard weight per passenger for this calculation.

REGIONAL/LOCAL CARRIER SERVICES Scheduled services operated by Canadian carriers other than Level 1 carriers. In addition, the term applies to scheduled operations of foreign carriers to/from Canada using aircraft with individual gross takeoff weight of less than 30,000 kg (66,000 lb.)

REGISTERED AIRCRAFT All aircraft (active or inactive) that appear on the Canadian Civil Aircraft Register (CCAR).

REVENUE CARGO Air freight, air express and excess baggage for which any tariff is charged. Revenue cargo does not include mail and stores, or passenger baggage for which no charge is made.

REVENUE PASSENGERS Passengers paying 25% or more of the normal applicable economy fare.

SCHEDULED SERVICE Transportation of passengers or goods by aircraft whereby the carrier or his agent operates the air service and sells seats or cargo space directly to the public on the basis of price per seat, per unit of weight or volume for cargo, or per kilometre.

SMALL AIRPORTS Airports other than the "Top 77" (see Large Airports) and for which aviation forecasting responsibility lies with Transport Canada regional offices.

SOUTHERN CANADA For purposes of economic regulation, that part of Canada south of the "designated area" (see Northern Canada).

TONNE-KILOMETRE The measure of the carriage of one tonne of load (passengers and/or goods) through a distance of one kilometre. A total of tonne-kilometres is obtained by summing passenger tonne-kilometres and goods tonne-kilometres (See definitions).

TOTAL COMMERCIAL PILOTS The number of commercial pilots (aeroplane, helicopter and other) having licences in force at the end of a given calendar year.

TOTAL LICENSED PERSONNEL (excluding student permits) The number of pilots, flight navigators, flight engineers, air traffic controllers and aircraft maintenance engineers with licences in force at the end of a given calendar year.

TOWER AIRPORTS Canadian airports with air-traffic-control towers. (In 1988 there were 60 tower airports in Canada.)

TRANSBORDER SERVICE Air transportation provided on an international flight between Canada and the United States (including Alaska and Hawaii).

Transport Canada Regions (Air)